Letter 13

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May 4, 2001

Bureau of Land Management
Battle Mountain Field Office
Attn: Pam Jarnecke
50 Bastian Road
Battle Mountain, NV 89820

Re: Comments on the Phoenix Project Draft Environmental Impact Statement

Dear Ms. Jarnecke:

13-1 Thank you for this opportunity to provide comments on the subject DEIS and associated documents. This letter contains our comments regarding the project as proposed. Because they are relevant to this NEPA process, we have attached to this letter the text of the comment letter we provided to the Nevada Division of Environmental Protection regarding the renewal of the Nevada Water Pollution Control Permit. It is relevant because the BLM relies on NDEP for permit issuance and gives it credence in the DEIS. DEIS at 3.2-60. Ultimately, the BLM is responsible for assuring that undue or unnecessary degradation (uud) does not occur on public lands, regardless of whether the State issues a permit. Please consider those comments as you would consider comments directly on the DEIS or other NEPA documents.

13-2 Our conclusion is that the proposed action will neither protect either surface or ground water from pollution in violation of the Clean Water Act and Nevada Pollution Control Act. It will also illegally cause nearby streams and springs to go dry. Drying streams and tributary springs also violates the Clean Water Act and Public Water Reserve No. 107 (Executive Order of April 17, 1926). The project will further affect the groundwater balance in the region by decreasing the recharge in the region which is partly responsible for the extent of the dewatering impacts. Tailings deposition in drainages is also illegal. There is also substantial evidence that the bond is insufficient and that Newmont does not have the financial resources to complete this project while protecting the other resources. For these reasons, the project as proposed will cause undue or unnecessary degradation and may not be permitted.

The documentation provides substantial evidence that the No Action alternative is also illegal because it will result in groundwater degradation. Therefore, an alternative that both treats the contamination problems and reclaims the existing disturbance is desirable. We offer below a description of a **project modification** that may protect the waters of the state and U.S. while allowing Newmont to profit from this mine. This alternative must be fully considered under NEPA. But, ultimately, the waste rock produced by this project must be kept dry. The groundwater levels in the pits will change too much to rely on submerging the waste rock to shut off oxidation. Our alternatives focus on that objective, but the BLM and Newmont/BMG are ultimately responsible for it.

Every truth passes through three stages before it is recognized. In the first, it is ridiculed. In the second, it is opposed. In the third, it is regarded as self-evident. Schopenhauer

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13-1 The BLM is the authorized agency to assure that any locatable mineral development activity is compliant with the surface management regulations (43 CFR § 3809). This includes a requirement that the approved operations comply with all applicable state laws (43 CFR § 3809.2-2). Any plan of operations approval is contingent upon the operator obtaining the required state permits. The information and questions contained in the attached letter to the Nevada Division of Environmental Protection, addressed to Mr. Dave Gaskin, focus on the State's implementation of its regulatory programs relating to water quality protection. The BLM has reviewed the State's responses to that letter, which were included in the State's January 17, 2001, Notice of Decision approving modification of Water Pollution Control Permit NEV87061, and refers the commenter to those responses for additional information. Those responses indicate that the proposed operations will comply with applicable state water quality laws and support the BLM's conclusion that the Proposed Action, with appropriate mitigation, will not cause unnecessary or undue degradation to the public lands.

13-2 Comments noted. The BLM believes that the Proposed Action, as mitigated, and with the appropriate financial sureties in place, would not cause unnecessary or undue degradation to public lands or violate federal or state water quality laws. The specific statements in this comment are addressed in the following responses to the remaining, more detailed comments in this letter.

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13-2 We also offer substantial additional comments about many aspects of the project's impacts including air pollution, reclamation, socio-economics, and more. Our ultimate goal with these comments is that in one hundred years this mountain will be in much better condition than it is today, whether the current mining proposal goes forward or not.

For this letter, in addition to the draft environmental impact statement (DEIS), we have reviewed the following documents that are a part of the record for this project. Comments regarding these are included within this letter.

Addendum to Baseline Hydrologic Characterization Report, Phoenix Project, Lander County, Nevada, August 4, 2000. Baker Consultants, Inc. Hereinafter Groundwater Report.

Hydrochemical Characterization of the Proposed Phoenix Project, Lander County, Nevada. Exponent. August, 2000. Hereinafter Waste Rock Report.

13-3 **The BLM failed to consider the requirements of recent Interior Department directives regarding the review of plans of operations**

On January 18, 2001, Interior Solicitor John Leshy released a Memorandum, co-signed by Interior Secretary Babbitt, to the Director of the BLM, under the subject heading "Use of Mining Claims for Purposes Ancillary to Mineral Extraction." This Memorandum discusses the duty of the BLM to analyze mining and millsite claims when reviewing a proposed plan of operations, and the proper regulatory discretion over large-scale mining operations similar to the Phoenix Project, among other issues directly relevant to this case.

In particular, the Memorandum directs the BLM review whether the lode (and millsite) claims used for ancillary facilities such as a number of the waste rock dumps, tailings ponds and heap leach facilities, among others, are valid. In this case, the DEIS admits that many of such lode claims have been located upon lands that do not contain any "known or inferred mineable ore." DEIS at ii-iii. *See also* Plan of Operations, Appendix A for a listing of the claims.

Therefore, the procedures for compliance with FLPMA and the Mining Law (including the discretion to deny the use of these lands for mining-related facilities) noted in that Memorandum, must be followed. The revised DEIS must detail how the BLM complied with all of the Memorandum requirements. In addition to the issues discussed in the Memorandum, the fact that such ancillary facilities will permanently result in an exclusion of other multiple uses of public lands calls into serious question the legality of approving such uses under FLPMA. *See* Flynn, *The 1872 Mining Law as an Impediment to Mineral Development on the Public Lands: A 19th Century Law Meets the Realities of Modern Mining*, 34 LAND AND WATER LAW REVIEW 301, 362-372 (1999). The BLM should also ascertain the amount of, and require, the payment of fair market value by the company for the use of public land not covered by valid claims. *See* Id. Furthermore, the Memorandum requires that the NEPA analysis in this case be redone so that it is based on the fact that these claims are likely invalid.

13-4 **The site is currently extremely polluted and has degraded ground- and surface waters.**

This site currently has and continues to degrade both surface and groundwater. Both groundwater and surface water is currently degraded. Water Resources Monitoring Plan at 14, 15. Groundwater pH varies from 5 to 10. TDS concentrations range up to almost 4000 mg/l. There are also high sulfate and metal concentrations. Water Resources Monitoring Plan at 14. Additional data, including the wells assumed to

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13-3 This comment raises issues directed primarily at compliance with the federal mining laws and the Federal Land Policy and Management Act, rather than NEPA. The BLM has the authority to contest the validity of mining claims and millsites at any time, prior to patent. However, the BLM does not typically conduct a mining claim and millsite validity examination when reviewing proposed plans of operations. Consistent with longstanding practices and current agency directives, additional millsites may be located in the project area prior to actual construction of the ancillary facilities. The BLM would ensure that any approved operations comply with the federal mining laws and any applicable agency directives implementing those laws. Consistent with the January 18, 2001, Solicitor's Memorandum, the BLM has, through the NEPA process, evaluated a broad range of alternatives, including alternative locations and configurations for various ancillary facilities. Consistent with other agency guidance under the federal mining laws, the BLM has determined that the Proposed Action, as mitigated, would not create unacceptable resource conflicts.

13-4 The comment highlights the existing concentrations of metals and other constituents in surface and ground water that have exceeded water quality standards. While some of the exceedences are likely due to past mining activities in Copper Canyon and surrounding areas, the pre-mining concentrations of many constituents probably naturally exceeded current water quality standards. It is not reasonable to expect that water quality in an area with mineral deposits exposed at the surface would meet all drinking water standards. Many mineralized areas have concentrations of metals in surface and ground water that are elevated relative to drinking water standards (Runnells et al. 1992).

BMG is currently recovering ground water near the tailings impoundment that has been affected by seepage of tailings water, and continued remedial activities would be part of both the Proposed Action and the No Action alternative.

represent background, should be provided. Mining has affected the surface water in Iron, Butte and Philadelphia Canyons. Water Resources Monitoring Plan at 15. A good plan of operations at this site can actually make existing conditions better. It is because of the existing pollution and lack of a adequate plan to address it, as will be discussed below, that we argue the No Action alternative, in addition to the proposed action, is unacceptable.

13-4 The DEIS documents degraded conditions. A few quotes serve to illustrate this point:

> Arsenic concentrations exceeded the drinking water standard of 0.05 milligram per liter in a number of samples and did not show a strong dependence on pH as did the other metals. Specific instances of arsenic exceedences occurred in ground water from Copper Canyon, the current Reona Leach Pad, the Fortitude Pit, Galena Canyon, the Midas Pit, the proposed Phoenix Pit, the proposed Reona Pit, and the West Copper Pit. DEIS at 3.2-32.

> Iron concentrations were highest in ground water samples from the Copper Leach Area and the Midas Pit, reaching 1,500 and 180 milligrams per liter, respectively. However, groundwater samples throughout the study area had iron concentrations that exceeded the secondary drinking water standard of 0.6 milligram per liter... DEIS at 3.2-34.

> Manganese concentrations show a pattern similar to iron, reaching their highest level of 190 milligrams per liter at the Copper Leach Area and show widespread exceedences of the secondary drinking water standard of 0.1 milligram per liter over the entire study area... Id.

It is reprehensible and illegal that the company and NDEP are not currently engaged in remediation of groundwaters when the concentrations exceed standards by 2500 and 1900 times for iron and manganese, respectively. In fact, if there were a nearby receptor, ie humans, at this site, it would probably qualify for Superfund status. The groundwater eventually reaches surface water as illustrated by exceedences there.

> The most acidic surface waters occurred adjacent to historic mining facilities and mineralized areas (e.g., Iron Canyon and Butte Canyon).... These surface waters also had the highest metal concentrations. In general, the metal concentrations in these springs and seeps exceed drinking water standards for antimony, arsenic, beryllium, cadmium, copper, chromium, fluoride, iron, magnesium, manganese, mercury, nickel, nitrate, pH, sulfate, total dissolved solids, and zinc. DEIS at 3.2-18.

Thus the groundwater seeps into surface water. Because there is no National Pollutant Discharge Elimination System (NPDES) permit for this discharge, it is illegal. See McClellan Ecological Seepage v. Weinberger[1]. This seepage may eventually provide receptors. In 25 years, the Battle Mountain Complex/ Phoenix Project may be considered a Superfund site.

The BLM should immediately initiate enforcement actions against Newmont/BMG

13-5 As noted herein and in the DEIS, the current operations at the site (the continuation of which is referred to as the No-Action Alternative) violate a number of state surface and ground water standards. These violations not only constitute "unnecessary or undue degradation" under both the "old" and "new" 3809

[1] McClellan Ecological Seepage v. Weinberger, 707 F. Supp. 1182.

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13-5 The EIS thoroughly evaluates existing conditions in the project area. As discussed in Sections 2.3.1 and 2.3.2 of the EIS, existing site conditions are being addressed in coordination with the NDEP, pursuant to various permits and plans, including reclamation plans and a state water pollution control permit that establishes a schedule of compliance for the site. While existing conditions would continue to be addressed under the No Action alternative pursuant to those regulatory requirements, the Proposed Action would further address many of these conditions.

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regulations, they are also a violation of the current Plan of Operations which was originally approved with the condition that the operations would always comply with these standards.

13-5 FLPMA requires that, "[i]n managing the public lands the Secretary shall, by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands." 43 USC § 1732(b). In the context of the FLPMA, when the imperative language "shall" is used, "Congress [leaves] the Secretary no discretion" in how to administer the Act. Natural Resources Defense Council, Inc. v. Jamison, 815 F. Supp. 454, 468 (D.D.C. 1992).

Since the BLM has acknowledged that the current operations are violating water quality standards, it must take immediate actions to rectify the problems. The BLM does not have discretion to stand aside and permit the violations, and by definition, unnecessary or undue degradation, to occur. The federal courts are clear that the "shall prevent unnecessary or undue degradation" requirement from FLPMA is a mandatory duty upon the BLM. Sierra Club v. Hodel, 848 F.2d 1068, 1074-1076 (10th Cir. 1988)(overturning lower court decision that said that FLPMA's "shall prevent ..." was discretionary).

Therefore, Great Basin Mine Watch formally requests that the BLM "take any action necessary" to "prevent" the further release of water from mine facilities, lands, and operations that exceed any water quality standard. At a minimum, this must entail an immediate noncompliance order and demand for immediate corrective action. If the violations are not stopped, a suspension of any operation causing or contributing to the violations must be ordered. Even if BLM believes that it has discretion in its decision whether to take immediate enforcement action under the new 3809 rules, the severity of the problem demands such action.

The project as proposed will illegally pollute surface and groundwater.

13-6 As documented above, the project currently degrades waters of the State. It is primarily waste rock and how it is handled that will determine whether this project will continue to degrade waters. The long-term water quality at the Phoenix Project depends on the chemistry of waste rock and ore and the expected reactions in the backfilled pits. All analyses show that most of the waste rock will be acid producing. DEIS at 3.2-34-37. It also depends on the quality and quantity of seepage through the waste rock dumps. Any seepage through surface waste rock dumps will have degraded water because they will remain unsaturated; water movement through them will increase the moisture to a range of from 5 to 6 percent. Waste Rock Report. This will leave substantial pore spaces empty and allow air movement. Oxidation will continue as these pore spaces will remain connected to an oxygen supply. The amount of pollution moving from the waste rock dumps will therefore depend on the amount of flow through the waste rock. The proposed action, with a five-foot cover, decrease the seepage as compared with a lesser cover, but it is insufficient. Details of the proposed action regarding the waste rock facilities will be discussed below. We will present an alternative cover design, which must be considered under the NEPA process, below.

Deeper rock may be more degrading than rock closer to the surface. "This overprinting also results in higher AGP values with increasing depth and proximity to the granodiorite intrusions." Waste Rock Report at 7. "Overprinting" refers to the replacement and dissolution of carbonate minerals by hydrothermal sulfide-bearing fluids during intrusion of the granodiorite stock. In English, this means that the acid neutralizing potential was replaced by acid generating potential and that the potential to generate acid increases with depth. The existing waste rock facilities and other disturbances have caused the pollution discussed above. The DEIS summary of their characteristics documents significant acid producing properties. Because of the overprinting discussed above, the waste rock characteristics will only get worse as excavation of deeper ores proceeds. This suggests that a part of our alternative, which

13-6 The BLM disagrees that the project as proposed would illegally pollute surface and ground water. The proposed cap material and thickness, and the surface and ground water management plans, would adequately detect and mitigate impacts to those waters. Please also see the responses to comments 13-7 through 13-14.

This comment suggests that a smaller project alternative be evaluated based on the premise that the rock becomes more acid-producing with increased depth within the open pits; this premise is not true relative to the Phoenix Project. Once mining proceeds below the thin oxidized zone present at the surface, the sulfide content of the rock is controlled primarily by distance from the faults that were the conduits for mineralizing solutions. The faults are nearly vertical, and scaling back the proposed project to mine only shallower rock would therefore not result in excavation of rock with lower sulfide content. Please also see the response to comment 1-9.

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13-6 must be analyzed under NEPA, in this project includes a plan to not mine as deeply to avoid disturbing some of the more acid producing rock.

13-7 The DEIS does an incredibly poor job of documenting the results of groundwater quality modeling performed by Exponent. The DEIS completely fails to discuss predictions of sulfate concentrations that will approach 50,000 ppm after 130 years, however it does discuss all of the reasons why the predictions are uncertain. DEIS at 3.2-56. The DEIS should present Tables 7-1 and 7-2 from the Waste Rock Report. Table 7-1 shows that sulfate concentrations beneath the proposed waste rock facilities should approach 1000 to 5000 ppm while in the No Action alternative, the concentrations will increase by up to 50,000 ppm. Both results show that the waters of the state will be illegally degraded.

The report indicates correctly that long-term predictions of effects on groundwater are very uncertain. Waste Rock Report at 50. However, the predictions of sulfate concentrations reaching 50,000 ppm are alarming. These levels are predicted to occur after just a 100 years with return to background requiring up to 20,000 years. A meaningful confidence band around the prediction of concentration with time would probably reveal a significant probability that very high, on the order of tens of thousands of ppm, concentrations could occur after just a few decades. It is possible the actual recharge from the waste rock facilities exceeds that used in the model. If this is the case, the higher concentrations will be reached much more quickly, possibly in just decades. This would reflect the observed conditions at existing monitoring wells. Because of the huge consequences of such additional contaminant loadings, the study should examine the sensitivity of the predictions as a function of input hydrologic uncertainties.

13-8 The report also cites six items that may decrease loading in the future. They are: increasing root depth, increasing silicate neutralization, sulfate-mineral solubility limits, attenuation by foundation materials, evolution of waste-rock moisture storage, and change in oxidation. Waste Rock Report at 51. However, some of these issues could affect the recharge the other way. First, root depth may not reach five feet, much less be deeper than the cap. Also, the long-term plant density may be less than expected due to various reasons including toxicologic effects brought on by unexpected groundwater or surface water movement. Evolution of waste-rock moisture storage will increase the storage if weathering decreases the particle size. Conversely, preferential flow patterns, such as finger flow or fracture flow, that will likely occur in the facilities will effectively decrease the volume available for moisture to be stored. In fact, the one-dimensional modeling assumes a flat surface, the wetting front, moves downward through the waste rock. In reality, the wetting front may be quite irregular, with fingers of flow far below the wetting front or with significant streams set up in fractures that prevail in a waste rock dump. It is unlikely that the cores taken to determine moisture contents and which accurately documented a wetting front would actually observe this type of flow or whether high moisture contents observed at depth is not actually due to preferential flow. Attenuation in the alluvium beneath the dumps may also be quite limited as indicated by the failure of the alluvium to attenuate the acid leaching beneath the Copper Leach Facility. DEIS at 3.2-39.

13-9 The seepage estimates, primarily controlled by the infiltration through the cap, control the predictions. The hydrologic basis of the estimates are fraught with many problems. The analysis considers for effects caused by the waste rock facilities: "1) the potential for construction of waste-rock facilities to change groundwater recharge rates, 2)the potential for loading of solutes leach from waste rock to groundwater, 3) the discharge rate and quality of water seeping from the toes of waste-rock facilities, and 4) the potential for direct solute release to groundwater after mining, when waste rock in backfilled pits would be flooded by the rebounding water table. Waste Rock Report at 27.

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13-7 Tables 7-1 and 7-2 in the Hydrochemical Characterization Report (Exponent 2000a) are included in the EIS as Tables A-4 and A-5 in Appendix A. The geochemical modeling results presented in those tables are based on the conservative assumption that all of the sulfide present in the waste rock would oxidize and that all of the resultant sulfate would be released to ground water. As this is a conservative assumption, it is difficult to imagine conditions under which the predicted concentrations would be exceeded. The Contingent Long-term Groundwater Management Plan (Brown and Caldwell 2000c) includes measures to capture and treat affected ground water that could potentially migrate from the waste rock storage facilities.

13-8 The infiltration modeling performed by Exponent (2000a) is based on reasonable estimates of root depth, plant density, and moisture storage capacity that would exist in the waste rock facilities. As stated previously, the geochemical model also conservatively assumed that all of the waste rock would eventually oxidize and release constituents that would eventually migrate to ground water. If the modeling overpredicted the amount of evapotranspiration that would occur through the cap (resulting from a shallower rooting depth and/or lower plant density), or if preferential pathways develop in the waste rock facilities, as suggested in the comment, then less time would be required for solute from the waste rock to reach ground water than was predicted. However, regardless of the wetting front migration rate that occurs or the concentration of constituents of concern within the solute, the Contingent Long-term Groundwater Management Plan and mitigation measures WR-5 and WR-6 include appropriate monitoring, capture, and treatment technology to prevent the migration of impacted ground water from the project area.

13-9 Please see the responses to comments 13-7 and 13-8.

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13-10 The waste rock caps are essential for minimizing or eliminating seepage into the waste rock because the wetting and drying associated with substantial seepage events would degrade downgradient waters. The report indicates that waste rock with an "excess of net-neutralizing, low-sulfide waste rock" will be used to cap the waste rock dumps. Waste Rock Report at 31. It does not describe the hydraulic properties other than to provide the HELP estimated infiltration rates. Appendix B4 describes the unsaturated hydrology of the waste rock facilities. None of the documents describe how the cover will actually be created by crushing waste rock.

13-11 One-dimensional, unsaturated flow models were used to predict flow through the caps. Little confidence is gained by verifying results from HELP with another code, SOILCOVER. Waste Rock Report at B4-4. This only proves that the codes solve the same the mathematical equations in the same way. The best way to verify code is to show that it accurately simulates analytical solutions to simple representations of the equations. The best way to verify a model is to show that it matches field conditions. The fact that a HELP parameter, the evaporative-zone depth, is determined by SOILCOVER is more disturbing. Waste Rock Report at B4-5. This depth should be measured, or at least the calibrated value should be compared with measured values. The discussions about the modeling lead the reader to think the analyses are correct or accurate merely because they used this wonderful code.

13-12 One dimensional modeling with HELP ignores lateral flow **within** the waste rock. Compaction may have caused the vertical conductivity to be less than the horizontal conductivity. The modeling performed herein ignores this possibility. Horizontal flow could cause seeps to form on the sides of the waste rock dumps. Saturated hydraulic conductivities on the tops of waste rock dumps near .1 to .2 ft/d; on side slopes they are 5 to 10 ft/d. B4-15. This suggests that heterogenous conditions exist in the waste rock and on the caps. Even if there is an attempt to place similar material uniformly on each facility, the process of moving material and crushing rock causes sorting. As fines settle, the conductivity lower in a layer becomes less than that higher in the layer. Taking the path of least resistance, horizontal flow results and there is an effective vertical anisotropy much greater than the 1.0 value that apparently was used in the modeling.

13-13 The climatic input to the models is also questionable. The estimated values for the 300- and 500- year, 24-hour rainfall, at Battle Mountain may be significantly low. We base this observation on the fact that the maximum 24-hour rainfall recorded at Elko, Ely, and Reno, NV is 4.13, 2.87, and 2.37 inches, respectively[2]. Clearly these sites differ from Battle Mountain, but it seems very unlikely that the differences are as substantial as the reference indicates. We also note that it is very poor scientific practice to rely on personal communication (ie, Ashby, 1996) for something as important as the input data to a model. If Ashby performed a statistical analysis rather than a providing guess, the analysis should be a part of the report. This is extremely important because of the amount of infiltration that may occur in a four to five inch event, even if it is very infrequent.

13-14 An additional concern is the with the way precipitation at the site is merely a scaling of daily values at Battle Mountain according to the ratio of annual rates. Waste Rock Report at B4-17. At higher elevations, the additional annual precipitation is due more to additional precipitation days than to more precipitation on the same days it storms in Battle Mountain. This would lead to wetter conditions lasting longer and less opportunity for runoff. This assumption in the climate input probably leads to a much lower estimate of infiltration than actually occurs because less frequent, higher rainfall storms would lead to more runoff (less infiltration).

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[2]Williams, J., 1995. The Weather Almanac. Vintage Press.

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13-10 As discussed in Section 2.4.18 of the EIS, cap material for the waste rock facilities would consist of "…oxide, benign, and/or amended waste rock or other suitable material." Although the waste rock used for cap material is anticipated to break down to a rocky soil during mining, transportation, end dumping, and final grading, the waste rock would not be processed through a crusher. The assumption that the material would break down to a soil that would support vegetation is based on past experience at the nearby Copper Basin mining area.

13-11 The estimates for evaporative zone depth in the models used to estimate net infiltration rates were calibrated to several sets of measured data. For example, in vegetated waste rock caps, measured soil moisture in the top 5 feet of Copper Basin waste rock during the spring and fall of 1996 showed evaporative loss to a depth of 48 inches (Exponent 2000a, Figure B4-14), and the SoilCover model was calibrated accurately to these soil moisture profiles in these revegetated caps (Exponent 2000a, page B4-21 and Figure B4-13). The base-case (i.e., using the most probable estimates for all model parameters) simulations of water balance in vegetated waste rock caps, using the HELP model, used an evaporative zone depth of 48 inches (Exponent 2000a, Table B4-7b). In addition, 11 moisture profiles through the entire depth of uncapped waste rock facilities found that wetting fronts ("wet" rock was indicated by an average gravimetric moisture content of 4.5 percent, and rock below the wetting front had an average moisture content of 1.7 percent) had penetrated to 40 to 50 feet over a 10-year period of exposure (Exponent 2000a; page A9-2 and Figures A9-1c, A9-2, A9-3a, and A9-3b). The base-case simulations with the HELP model for uncovered rock matched these findings, with infiltration sufficient to produce a 50-foot-deep zone of rock wet to 4.5 percent gravimetric moisture (Exponent 2000a, page B4-22, second paragraph).

13-12 Rigorous simulation of the heterogeneity and anisotropy within waste rock facilities is impractical. Visual observations at this and other mines indicate that end-dumped waste rock facilities are typically heterogeneous and anisotropic, containing sloping layers of coarser and finer material. Theoretically, the hydraulic conductivity in a portion of one such layer could be estimated. However, differential movement of coarse and fine materials during facility construction (i.e., end-dumping from haul trucks) segregates material by particle size along these layers. As a result, the internal connectivity of conductive layers is difficult to estimate, and thus cannot be simulated reliably. Despite these difficulties, empirical evidence from existing Copper Canyon waste rock suggests that horizontal flow within waste rock facilities is unimportant. Specifically, significant horizontal flow along conductive layers within waste rock would tend to form surface seeps, yet existing uncapped Copper Canyon waste rock facilities have not formed surface seeps other than at their toes. (Note that toe seepage, the flow along the contact between the base of waste rock and underlying soil and bedrock, was estimated for the Phoenix Project with two-dimensional simulations of waste rock hydraulics using the SEEP/W model [Exponent 2000a, Appendix B4]). Relative to conditions in existing waste rock, the tendency for horizontal flow within waste rock layers would decrease dramatically following capping, when net infiltration of meteoric water is predicted to decrease by 90 percent or more (Exponent 2000a, Tables B4-7a and B4-7b). Thus, the absence of significant horizontal flow and surface seepage within the existing uncapped waste rock facilities strongly suggests that there would not be surface seepage in the future from the proposed capped facilities.

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13-13 Estimates for the magnitude of infrequent storms, such as 300- or 500-year events, are, by necessity, calculated using statistical methods. The estimated 300- and 500-year 24-hour rainfall events for Battle Mountain (2.6 and 2.8 inches/day, respectively; Exponent 2000a, page B4-18) are generally consistent with the general maximum 24-hour values observed at Ely, Elko, and Reno, Nevada (i.e., 4.13, 2.87, and 2.37 inches, respectively). Although modeling of net infiltration through waste rock was based on 100-year simulations with the HELP model, the 300- and 500-year events were included because the simulations of solute flux were extrapolated beyond 100 years. Values for these infrequent storm events are not provided by CLIGEN (i.e., the model used to generate the 100-year climate records), and they were most easily obtained by personal communication with Ashby (1996) at the Desert Research Institute. Finally, the magnitude of major storm events increases only minimally beyond the 100-year event (e.g., the estimated difference between the 300- and 500-year storm events is only 0.2 inch); therefore, the long-term average net infiltration is relatively insensitive to the magnitude of these infrequent events.

13-14 The scaling of measured precipitation data at climate stations to higher elevations by linearly increasing the amount of precipitation in each simulated event is a reasonable simplification used in modeling water balance in the waste rock caps. More frequent precipitation in smaller events would tend to increase relative humidity and decrease evapotranspiration; however, this effect would be offset, or even exceeded, by the fact that smaller precipitation events would produce less infiltration. The uncertainty in this effect, whichever way it influences net infiltration, was incorporated by calibrating the HELP model to the wetting fronts observed in the 10-year-old waste rock facilities. Please also see the response to comment 13-10 above.

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13-15 Additional problems with the climate input include the use of solar radiation and relative humidity from Battle Mountain. This would cause an overestimate of the evapotranspiration (ET) from the site. Waste Rock Report at B4-19. In addition to more and more frequent precipitation, the ranges in Nevada are also cloudier and have more moisture resulting in higher relative humidity. More radiation heats the soil faster; lower relative humidity means that there is more "space in the air" to store evaporated water. Both would increase the ET and dry out the waste rock cover faster.

13-16 The results for seepage into the bedrock beneath the waste rock dumps are dubious. The description in the text does not match the figures to which it refers. "Model results indicate that for all facilities underlain by bedrock, water will infiltrate vertically through the waste rock, then migrate laterally for some distance within the thin colluvial cover overlying the bedrock, and then flow vertically into the bedrock (Figures B4-14 and B4-15)." Waste Rock Report at B4-24. The cited figures show flow nets with vertical seepage reaching the colluvium that naturally covers the bedrock. In the colluvium, the seepage parallels the ground surface, presumably reflecting conductivity differences. At the edge of the waste rock dump, one flow arrow enters the bedrock. The Butte Canyon, one Philadelphia Canyon and North Fortitude cross-sections show one arrow out of from four to seven entering the bedrock; the upper Fortitude cross-section shows two arrows. In proper flow net analysis, flow arrows, or lines, should separate an equal quantity of flow. The implication here is that of the infiltration into the waste rock dump, from 25 to 12 percent enters the ground beneath the facility. The remainder, as indicated by arrow on the cross-sections, exit at the base of the facility. This should be much larger than 0.02 gpm. Waste Rock Report at B-24. The report acknowledges that additional flow would reach the surface "[i]f the colluvium thins downgradient of the waste-rock facilities". Id. However, the suggestion that "model results are consistent with the actual site conditions" because of "[o]bservations of seepage at existing facilities indicate that seeps form in areas where the colluvium is not present" is wrong. Id. There have been substantial observations of seepage at existing facilities; the predictions here are that there will be essentially no seepage. The modeler makes the statement about seepage if the colluvium thins; the statement is based on the site observations. No model results showed this seepage. This observation does not verify the model.

13-17 Unsaturated hydraulic conductivity for bedrock based on measurements at Yucca Mountain is probably acceptable, except that flow through bedrock does not even approximate homogeneity. Waste Rock Report at B4-14. The one-dimensional modeling treats the bedrock foundation as a homogeneous porous media. It is essential to consider fractures. This analysis should be redone to consider the bedrock as a fractured media. Even using the homogenous, porous media assumption yields substantial problems as indicated by comparing Figures B4-10 and B4-11. Minuscule moisture changes yield substantial changes in hydraulic conductivity. Figure B4-11 shows that water potential changes from -100 m to saturated conditions represents a minuscule change in moisture content. However, for the same water potential change there is a two order of magnitude change in hydraulic conductivity and then, once saturation is reached, there is another five order change in hydraulic conductivity. Figure B4-10. The model is very sensitive to small changes in moisture, therefore the predicted results are very dubious.

13-18 **Backfilling pits is not sufficient to stop oxidation and groundwater degradation**

The proposed action identifies "strategies to minimize oxidation and associated amendment rates in subaqueous-zone pit backfill. Key among these are minimizing the duration that waste-rock surfaces are exposed to the atmosphere before backfilling, avoiding multiple re-handling of waste before backfilling, backfilling the subaqueous zone of the pit as rapidly as possible, and placing the highest-sulfide waste in the subaqueous zone to permanently isolated (sic) from further oxidation." Waste Rock Report at 42. "Oxidation would essentially cease after this waste rock is flooded, providing permanent, stable

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13-15 Values for solar radiation, precipitation, and relative humidity do vary by elevation and location relative to mountain ranges. The most important of these, the variability in precipitation with elevation, was incorporated into the modeling. These other microscale climate effects were not incorporated into the water balance modeling because net infiltration is much less sensitive to these parameters than to precipitation.

13-16 The cross-sections of waste rock facilities (Exponent 2000a, Figures B4-14 and B4-15) are not flow nets. Rather, the heavy black lines are particle tracks, and their locations were selected to illustrate the general range in flow paths predicted by the model. Regarding the occurrence of toe seepage from existing waste-rock, no seepage has been observed from the toes of capped waste rock facilities in Copper Basin. These existing capped facilities are most analogous to the SEEP/W model for Phoenix Project waste rock, which simulated long-term water flow in capped waste rock facilities.

13-17 The bedrock is simulated as an equivalent porous medium rather than a fractured matrix. The model of moisture flow from the surface to the water table represents the average porosity of the bedrock, as measured by the hydraulic storage in aquifer testing undertaken to support the ground water model. Percolating water would reach the water table sooner than the average at some locations and later than the average at others. Regarding the relationship between hydraulic conductivity and moisture, it is true that the hydraulic conductivity of the waste rock decreases by almost six orders of magnitude as moisture content drops from saturation to 0.07 percent (Exponent 2000a, Figures B4-10 and B4-11). This characteristic is typical of all porous media.

13-18 Based on modeling, submerging the backfill would be sufficient to eliminate oxidation of contained sulfides. In addition, the Proposed Action includes amending submerged backfill material to neutralize and control potential acid generation and metals mobility; see Section 2.4.2 of the EIS.

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13-18 placement of this material." Waste Rock Report at 45. "Submerging waste rock in pit backfill facilities below the post mining watertable is intended to eliminate contact with atmospheric oxygen and limit the potential for producing acidic solutions." DEIS at 2-43. They are insufficient because the tests are dubious and submerging the backfill is insufficient.

13-19 The tests of amendments reported in Appendix B2 are unrealistic in field conditions because they would assure saturated conditions and maximum contact among the constituents. In the field, preferential flow paths and poorly mixed amendments would render the amendments less effective. Laboratory conditions are not field conditions. It is **absolutely essential** that the field tests being performed by BMG be **included in the FEIS** or the final decision will be based on unproven methodology. Waste Rock Report at B2-12.

13-20 The data averaging suggests that waste rock may be treated as one homogeneous mass. "Average acid/base accounting characteristics of each waste-rock facility was estimated from measurements of materials that are representative of each facility". Waste Rock Report at 9. Table 3.2-19 provides average net neutralizing potential. DEIS at 3.2-56. Note that all of the facilities are negative, meaning they will be acid producers. Averages do not represent the range expected in the facility and may underestimate the minimum pH that may occur in parts of the facilities. If the NNP is not distributed uniformly, the waste rock facility will not perform as expected by treating as a homogeneous mass. Portions of the facility with substantial acid-producing properties may cause zones with pH substantially below the average. The continued movement of that water through the facility will not substantially alter the NNP distribution. While encapsulating sulfidic waste rock in highly neutralizing rock **may** neutralize the seepage, similar results will not occur for seepage through a zone of lower acid producing properties. In other words, pH will not be altered in flow from a volume of highly negative NNP through a zone of less negative NNP. The report and plan must consider the effect of highly acid producing zones in the waste rock facilities.

13-21 Some of the tests are also questionable and may underestimate the oxidation potential. It is difficult to see how "drape and chamber" tests provide accurate oxygen consumption rates. Waste Rock Report at 11 and Appendix A15. Nothing limits leakage from the sides of the volume, within the rock, being tested. Oxygen concentrations within the chamber drop rapidly and are "followed by a leveling of the concentration at a value below the atmospheric concentration." Id. This makes no sense or is at least explained poorly. Is the overall pressure within the volume less than atmospheric? If there is "no leakage", then consuming oxygen would cause a reduction in its partial pressure. Without leakage, no atmospheric gas could move in to replace it. If this in fact occurs, oxygen flow limitations would probably cause the results to be an underestimate of the consumption rate that would be seen in reality. An underestimate would also underestimate the predicted acid generating properties. But, as mentioned above, it is difficult to understand how this process prevents air, and oxygen, from reaching the volume from the sides. The reader should have little confidence in these results.

13-22 The intrinsic oxidation rate measured on the waste rock columns has similar problems as did the drape method discussed above. Waste Rock Report at A18-2. The method runs groundwater through a sample, then clamps off the sample to prevent new air from reaching it. As oxygen concentrations decrease during the overnight experiment, rates would also decrease. In reality, atmospheric oxygen would rush in to replace that lost. The results of this experiment, at best, represent a very low minimum estimate. The test then underestimates the leachable metals and other contaminants by eliminating air from the leaching and by infiltrating the water in an unnatural way. The test runs 0.9 pore volumes of groundwater at a time through the column, allowing each to equilibrate with the sample. This assures the maximum contact time and the maximum leaching of metals. Forcing the water up through the

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13-19 The Proposed Action includes amendment of subaqueous pit backfill material with lime or limestone to neutralize acid generated by oxidation of sulfides, and potentially with organic materials to cause chemical reduction of sulfate (see Section 2.4.2). The specific details of the amendment program would be adjusted based on continuing monitoring and testing. The amendment approach is based on established technology. The Contingent Long-term Groundwater Management Plan (Brown and Caldwell 2000c) provides additional assurance that oxidation products that might migrate from the backfilled pits would be captured to prevent impacts to ground water downgradient of the waste rock facilities.

13-20 The application rate of amendments to pit backfill material would be adjusted based on the ongoing ABA or NAG testing program for each blast pattern and would be increased for materials with higher acid-generating potential.

13-21 The drape-and-chamber tests of oxidation rate in pit benches were conducted to support an assessment of pit lake water quality in an earlier plan of operations for the Phoenix Project. These results were not used in the modeling presented in the Phoenix Project Hydrochemical Characterization Report (Exponent 2000a).

13-22 The pit backfill simulation column tests (Exponent 2000a, Appendix A18) were designed to measure the amount of solute released by waste rock backfilled in a pit when it eventually floods with ground water. Samples of waste rock from Copper Canyon were collected by drilling into existing waste rock facilities, and care was taken to store the samples under anoxic conditions to avoid altering the amount of oxidation products in the material. The sulfide waste rock backfilled into pits oxidizes partially during handling, but the rock placed below the surface is expected be anoxic. In waste rock backfilled to a pit, there is little potential for the type of venting or chimney effects that commonly induce air flow in sulfidic waste rock deposited on steep slopes. Instead, oxygen in the pores of backfilled pits is consumed relatively quickly by reaction with sulfide minerals, and oxygen entering the surface of the waste rock, either by simple diffusion or to fill the voids created by a declining water table, is consumed by reaction with sulfide minerals near the surface before it reaches more than a few tens of feet into the backfill. Therefore, while oxidation of a proportionally small volume of sulfide material would occur near the reclaimed surface of the backfilled waste rock, fluctuation of the postmining ground water table would not result in significantly greater impacts to ground water quality. Additionally, any constituent loading to ground water caused by the oxidizing waste rock would be detected and mitigated as part of the Contingent Long-term Groundwater Management Plan.

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13-22 column assures that saturation is maintained. By keeping the sample saturated, the method prevents air from getting into the sample, therefore there is no additional oxidation. It ignores wetting and drying caused by variable groundwater levels or recharge rates. This underestimates the total potential metal loading from the sample as compared with what would occur in reality where the rock would undergo wetting and drying. See the discussions elsewhere in this comment letter about changing groundwater levels and variable seepage rates through the waste rock. Thus, both the estimates of leachable metals and the total pore volumes required to reach equilibration are likely to be low.

13-23 The analysis assumes that backfilling pits will eliminate oxidation by making some incorrect assumptions. The best description of these assumptions follows:

> In pits backfilled with waste rock, the potential for solute release is relatively small. The buried waste rock would oxidize only slightly–the cumulative effect of air introduced to pores during handling and diffusion into the surface before final burial. **Once buried, oxygen cannot enter the waste rock through either convection or diffusion**, and oxidation in the deep-pit backfill would cease. Similarly, **oxidation in the pit wall rock would occur only when the pit is empty** (a relatively short time for the deeper portions of the pit), and would cease upon burial with waste rock. Constituents solubilized by this oxidation would be released to the initial groundwater flooding the waste rock, and **no further oxidation would occur**. Waste Rock Report at 37, emphases added.

This statement and the assumptions therein are wrong unless a **vacuum** forms in the pore spaces. Upon removal from the earth and fracturing, substantial oxygen reaches the rock surfaces as indicated. When the waste rock is placed or dumped into the pit, the pore spaces will be full of air. The only way that the oxygen within that air is all of the oxygen used for oxidation is for a vacuum, or more realistically, air pressures up to 20% lower than atmospheric to exist. The consumption of oxygen lowers the pressure in the pores and creates a gradient for additional air to move in to replace that which is consumed. The gradient for oxygen will be even greater; as the partial pressure of oxygen within the pore spaces decreases, there will be a gradient driving oxygen to replace that which is consumed. The only thing that prevents oxygen from reaching the depths is the rate it is consumed in overlying waste rock. The same argument holds for oxidation of the pit walls; oxygen reaches it through the backfilled waste rock and through pores that are connected to the surface. Thus, it is not a question of whether this rock will be oxidized, it is a question of how long it will take because the crushing of the rock and the dewatering of the aquifers have allowed oxygen to contact sites not previously exposed to oxygen.

13-24 The argument that flooding the waste rock with groundwater will stop oxidation is equally fallacious unless the pit will reach a steady state condition, which it will not do. Historic groundwater observations show that levels may change by up to 160 feet depending on climatic conditions. The hydrologic analysis and groundwater modeling report show a system controlled by the annual amounts and seasonal distribution of recharge and complex fault and aquifer systems. Water levels change by tens of feet from year-to-year because of changes in recharge. The highest range reported was 160 feet. Water levels in nearby wells seemingly screened at the same level may differ substantially. In a small, arid watershed, the amount of water stored in the aquifers, and therefore the groundwater level, varies with recharge. Backfilled waste rock will be intermittently submerged which may be the worst thing that could happen as far as producing acid mine drainage (AMD).

13-25 Even if the pit groundwater levels do reach steady state, it is questionable whether the oxidation will cease. The Sleeper Lake in northern Nevada provides an interesting case study. Described simply, Amax (now Kinross) pumped groundwater into the pit to cover the sulfidic ore body. This occurred in

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13-23 Oxidation rates measured in the near surface of existing waste rock were fast (Exponent 2000a, page A14-2), and once waste rock is backfilled into a pit, no additional oxidation is expected to occur in that fraction of the rock placed below the future water table (Brown and Caldwell 2001). As noted in the response to comment 13-22, oxygen entering the waste rock by diffusion or advection is expected to be consumed near the surface (probably within a few tens of feet, based on the measured oxidation rates in the Main Fortitude waste rock facility — see Exponent 2000a, page A14-2) by reaction with sulfide minerals in overlying rock. All sulfidic waste rock placed above the water table was accounted for in the estimate of sulfate loading to ground water.

13-24 The implication that ground water elevations fluctuate up to 160 feet (year to year) depending on variations in seasonal recharge is incorrect. Ground water hydrographs for the monitoring wells were provided in Figures 2-4A, 2-4B, and 2-4C in Baker Consultants, Inc. 2000a. The hydrographs indicate that ground water elevations at the southern portion of Copper Canyon, particularly in the vicinity of the South Midas Pit, experienced significant declines (including declines of up to 155 feet in CP-5 and CP-6) since November 1998. The hydrographs also indicate that monitoring wells in this area consistently declined over this period independent of seasonal recharge effects. As explained in Baker Consultants, Inc. (2000a), the reduction of water levels in this area evidently resulted from ground water extraction that occurred during extensive exploration drilling in the South Midas Pit area (i.e., 175 exploration boreholes were drilled in this area between 1998 and 1999). Therefore, the large water-level declines noted in the comment were caused by exploration activities in the area and, as such, are unrelated to natural ground water fluctuations associated with seasonal recharge or climatic effects.

Most of the other hydrographs, for areas that were not affected by ground water extraction associated with mine exploration or pit dewatering, indicate that fluctuations in ground water elevations attributable to seasonal recharge effects are relatively small (typically in the 5- to 10-foot range). The largest natural fluctuation in ground water levels was observed at the Santa Fe Well, which rose approximately 38 feet following a period of unusually high precipitation that occurred in the spring of 1998.

It is important to understand that the ground water storage capacity within the fractured rock aquifers surrounding the pits would be much less than the storage capacity of the rock fill material placed in the pits. Ground water storage in fractured rocks is primarily controlled by open fractures. In general, fractured rocks typically have very low storage capacities, which are typically in the range of 1 to 2 percent or less of the rock mass. In contrast, storage within the rock fill would be controlled by interconnected pores or voids created between the rock particles. For this reason, the backfilled waste rock in the pits would have storage capacities that are likely to be an order of magnitude greater (i.e., 10 to 20 percent of the fill mass) than the surrounding fractured rock. Because of these contrasting storage properties, an equal amount of recharge applied to either the fractured rock or rock fill material would produce quite different responses. Specifically, the greater storage capacity of the rock fill compared to the surrounding fractured rock would tend to greatly dampen any seasonal or annual variations in recharge. In addition, capping and reclamation of the surface of the backfill material would substantially reduce the amount of recharge that occurs through the backfill material. For these reasons, once the ground water levels recover and reach equilibrium, large annual fluctuations in ground water levels in the backfilled pits are not anticipated.

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The calibrated numerical ground water model was used to predict the final recovered ground water elevations in the vicinity of the backfilled pits (Baker Consultants, Inc. 2000a). The Geochemical Characterization Report (Exponent 2000a) specifies that backfilled waste rock would be amended up to the model-predicted upper confidence limit of the postmining ground water table, and that the rate of addition of chemical amendment to the submerged backfill would be calculated to provide sufficient neutralization capacity for all sulfide present in the waste rock. These pit backfill requirements have been identified more clearly in the Water Quality Impacts section of Section 3.2.2.1 in the Final EIS. Any small fluctuation of the postmining ground water table that occurs is expected to be within the amended material, and therefore, ground water impacts would be controlled by the amendments. However, all backfilled pits are upgradient of ground water interception locations specified in the Contingent Long-term Groundwater Management Plan (Brown and Caldwell 2000c); therefore, any unforeseen impacts to water quality resulting from the backfilled material would be mitigated, if necessary, in accordance with this plan and mitigation measure WR-4 (Section 3.2.4).

The estimates of sulfate loading from waste rock to the water table in backfilled waste rock were consistent with the ground water model prediction (i.e., that the water tables in the backfilled pits would not vary by more than 40 feet relative to the base-case prediction, and that the ground water table would thus remain below the surface). The rapid oxidation rates measured in Copper Canyon waste rock (see the responses to comments 13-22 and 13-23) indicate that air pulled into the surface of backfilled waste rock by fluctuating water tables would be consumed near the surface, leaving the zone around the buried water table anoxic and thus unreactive. The sulfate produced by oxidation reactions above the water table can eventually be leached to the water table by meteoric water, and this effect is included in the model of long-term sulfate loading. The Contingent Long-term Groundwater Management Plan (Brown and Caldwell 2000c) includes measures to capture and treat ground water, if necessary, to prevent impacts to ground water quality downgradient of the backfilled pits.

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13-25 1996 or 97. They still need to add lime to control the pH, even though the sulfidic or is covered with a lake. The pore spaces within the sulfide ore would now be full of water, so oxidation should have ceased. Because they filled the pit quickly, the flow gradient should be away from the pit. The pH should be under control, but it is not. According to their 2000 annual report, "555 tons of lime was added to the pit lake for pH control, which is a 96%reduction from 1997 and a 21% reduction from 1999." Sleeper Mine Water Pollution control Permit #NEV50006; 2000 Annual Report. While this is a decrease from previous years, it shows that the pH is not yet under control. The weekly observations of pH show a variation from 8.46 to 6.4 in the Wood Pit and 8.14 to 6.71 in the Sleeper Pit during 2000. The lime has prevented low pH levels, but the fluctuations show a system far from being stabilized. High sulfate and TDS levels, along with certain high metal levels also illustrate the problems. During 2000, sulfate and TDS ranged from 980 to 1530 mg/l and 2340 to 2950 mg/l, respectively, at various levels in the Sleeper and Wood Pits. The situation at Sleeper is not under control after more than four years of submerging the sulfide ore body and adding lime. These are essentially the same plans provided here, except that the pit will be full of rock. It will be impossible to adjust the amendment levels and very costly to remediate a situation.

13-26 There is a long-term groundwater management plan provided to treat potential leakage of contaminants.

13-27 **The proposed retention and discharge of stormwater represents an illegal discharge into a water of the U.S.**

The DEIS describes a method for capturing seepage at the base of waste rock dumps to prevent it from reaching surface water sources. DEIS at 3.2-60,61. This would include the development of retention ponds. The DEIS fails to describe whether these ponds would be lined. Capturing acidic surface runoff only to allow it to seep into formations that run parallel to the drainage and to eventually possibly seep into the surface drainage defeats the purpose of retaining the seepage. (It may also be illegal, see McClellan Ecological Seepage v. Weinberger[3].)

The plan would also allow for "any treated water not put to beneficial use" to be "discharged at a location downgradient and/or without a connection (sic) to waters of the U.S." DEIS at 3.2-61. From this statement in the DEIS, it is unclear where it would be discharged. If it would be discharged into Iron Canyon, *a NPDES permit would be required*. Perhaps the confusion is caused by the questions regarding whether Iron Canyon remains a "waters of the U.S." after the Supreme Court decision in Solid Waste Agency of Northern Cook County v. U.S. Army Corps. of Engineers, et al[4]. DEIS at 3.4-6. A reading of Solid Waste Agency should eliminate the confusion. It merely affects the Migratory Bird Rule wherein the Corps was regulating isolated wetlands only because they were used by migratory birds. 51 Fed. Reg. 41217. "Permitting respondents (Corps of Engineers) to claim federal jurisdiction over **ponds and mudflats** falling within the "Migratory Bird Rule" would result in a significant impingement of the States' traditional and primary power over land and water use." Solid Waste Agency, at 13, emphasis added. Iron Canyon is a channel that eventually drains to the Reese River and on to the Humboldt River. There is nothing isolated about this nor is it a pond or mudflat. It is certainly not a wetland formed in a human-made gravel pit as was the case in Solid Waste Agency. In addition, the State of Nevada has determined that Iron Canyon and other similar watersheds is a water of the state.

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[3] Note 1.

[4] No. 99-1178, Jan. 9, 2001.

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13-25 The Sleeper Mine is a different site with a different geologic setting and operation/reclamation plans (including a pit lake at the Sleeper Mine) than those of the Phoenix Project (e.g., proposed pit backfilling and no pit lakes). As such, direct comparisons are not appropriate. Additionally, the Phoenix Project Plan of Operations contains the Contingent Long-term Groundwater Management Plan, and financial assurance will be in place prior to project startup.

13-26 As described in the EIS, the Proposed Action includes a Contingent Long-term Groundwater Management Plan (Brown and Caldwell 2000c) designed to prevent degradation of ground water quality in the postclosure period.

13-27 No discharge to Iron Canyon is proposed. The point of the referenced text in the "Storm Water Management" section is that the exposure of uncapped sulfide waste rock would be limited and controlled, and runoff would be managed and monitored (and treated as necessary) in compliance with the appropriate permits and agency requirements. Compliance with the state's reclamation and closure requirements also pertains to this issue, and additional monitoring and mitigation measures related to these issues are discussed in Section 3.2.4.

13-27 The fact that the canyon is ephemeral or intermittent is also irrelevant. In justifying their authority to regulate such discharges, the Corps published: "An ephemeral stream is a water of the United States, provided it has an OHWM (ordinary highwater mark). An ephemeral stream that does not have an OHWM is not a water of the United States. The frequency and duration at which water must be present to develop an OHWM has not been established for the Corps regulatory program.... We agree that ephemeral streams that are tributary to other waters of the United States are also waters of the United States, as long as they possess an OHWM. The upstream limit of waters of the United States is the point where the OHWM is no longer perceptible." 65 Fed. Reg. 12823. Iron Canyon certainly has a high water mark and is a water of the U.S. Any discharge to it requires a NPDES permit. Without such a permit, with every discharge Newmont will be violating the CWA.

13-28 **Questions about the Stormwater Pollution Prevention Plan**: The descriptions of the collection and treatment systems in both the DEIS and Stormwater Pollution Prevent Plan provide little detail with which to assess the capability of the system. Excepting the size of the surge pond, there are no numbers or design data. DEIS at 3.2-61.

1. What flood return interval will the "interim collection, monitoring, and treatment program" in Iron Canyon accommodate? What volume and flow rate will the ponds and pipes accommodate?

2. There should be more discussion of the portable treatment plant to be used under the proposed action. DEIS at 3.2-61. Because the plant would only operate during events, is it automatically triggered to turn on or does it depend on fallible humans to realize it is raining?

13-29 **Placement of Tailings in the Drainages are Illegal**

The tailings in the Copper Canyon drainage, and any other drainage, are illegal. Construction of the tailings facility in Copper Canyon (compare Figure 2-3 with 2-5 to see how the fill of the tailings, a heap and a waste rock dump will eliminate Copper Canyon) must be regulated as a discharge under Section 402 of the Clean Water Act. The plan fails to properly regulate the discharge of pollutants into Copper Canyon and other drainages resulting from the construction of a tailings impoundment.

Such construction will discharge rock, dirt, synthetic materials, and other pollutants into Copper Canyon. These materials are clearly "pollutants" for the purposes of coverage under Section 402.[5] The disposal of these pollutants into Copper Canyon via, among other sources, dump trucks, loaders, backhoes, and other equipment constitutes a "point source" under Section 402 as well. Concerned Area Residents for the Environment v. Southview Farm, 34 F.3d 114, 119 (2nd Cir. 1994). Copper Canyon is an intermittent stream and is considered a "water of the U.S." for purposes of the CWA. U.S. v. Earth Sciences, 599 F.2d 368, 373 (10th Cir. 1979); Quivira Mining Co. v. United States EPA, 765 F.2d 126, 129 (10th Cir. 1985). The construction of the facility will bury a substantial length of Copper Canyon. In this case, it is clear that the discharge of rock, dirt, liner material, and other pollutants into Copper Canyon must be covered under a NPDES permit. Since, under federal regulations, such material is a "pollutant" regulated under Section 402 and is not "fill" regulated under section 404. Bragg v. Robertson, 72 F. Supp.2d 642, 662 n.38 (S.D. W. Va. 1999) (vacated on other grounds, (April 24, 2001, 4th Circuit)). However, based on the proposed complete obliteration of a large segment of the stream bed, the full range of standards cannot be met and the tailings facility will have to be substantially redesigned in order to comply with the CWA.

[5] "Pollutant" is defined in the CWA to include, among other materials: rock, sand, solid waste, and industrial waste. 33 U.S.C. § 1362(6).

13-28 The interim storm water capacity at the Iron/Butte/Galena Canyon area is designed to accommodate the entire seasonal runoff from March through July 1998, which was an abnormally wet period. Overall, the life-of-project storm water system and the postreclamation system are designed to accommodate (convey and retain) a 100-year, 24-hour storm event under Antecedent Runoff Condition II (likely to be typical). This is substantially greater than any event occurring in 1998. The design exceeds the State of Nevada requirement that the system must fully contain all fluids accumulated from a 24-hour storm event with a 25-year recurrence interval. Further detail regarding the design is presented in the relevant storm water documents cited in the EIS (Brown and Caldwell 1998c, 2000f,g).

Storm water management would entail evaporation, use as process makeup water, and/or periodic treatment to an appropriate standard, if release were necessary. Given the monitoring provisions and the large seasonal capacity of the Iron/Butte/Galena Canyon system (based on the spring/summer 1998 runoff conditions), adequate storage volume should be present to allow periodic treatment, if needed. The portable treatment plant would be operated in a manner that ensures proper management of collected storm water and protection of the environment.

13-29 Please see the response to comment 3-4 regarding potential impacts to wetlands or waters of the U.S.

13-29

In this case, the applicant does not even propose to divert the stream around the impoundment. Even if they did proposed a diversion, it would be illegal. Such a diversion does not "maintain the natural structure and function of the ecosystem" in that watershed.

> The Clean Water Act (CWA) was "a bold and sweeping legislative initiative," United States v. Commonwealth of P.R., 721 F.2d 832, 834 (1st Cir. 1983), enacted to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. §1251(a)(1994). "This objective incorporated a broad, systematic view of the goal of maintaining and improving water quality: as the House report on the legislation put it, 'the word "integrity" ... refers to a condition in which the natural structure and function of ecosystems [are] maintained.'" United States v. Riverside Bayview Homes, Inc., 474 U.S. 121, 132, 106 S.Ct. 455, 462 (1985) (quoting H.R.Rep. No. 92-911, at 76 (1972) U.S. Code Cong. & Admin.News 1972, at 3744).

Dubois v. U.S. Department of Agriculture, 102 F.3d 1273, 1294 (1st Cir. 1996).

The applicant also relies on this tailings impoundment to claim that "no discharges of stormwater to waters of the U.S. are anticipated from any Phoenix Project facilities in Copper Canyon". How will the applicant monitor compliance with this? It should be a part of the water pollution control permit. But, as just discussed, preventing this flow may be illegal because it destroys the natural structure and function of the ecosystem.

A similar concern results from the inactive waste rock and leach facilities in Philadelphia Canyon. Currently, stormwater is retained to "prevent any run-off from contacting waters of the U.S." How is this and will this continue to be monitored[6]?

13-30

Drying Willow Creek and Other Streams is Illegal

The DEIS indicates in several places that the dewatering will cause a drawdown cone that will dry Willow Creek. "A reduction in groundwater levels in Willow Creek would likely reduce flows and possibly reduce the length of the perennial stream reach in this area. A reduction of flows in lower Willow Creek is considered a significant impact." DEIS at 3.2-48. This essentially eliminates that stream's current use. The elimination of any waters due to mining operations violates the water quality standards for those stream reaches and thus could not be permitted. The goal of the Clean Water Act (CWA) is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. § 1251(a). "The word 'integrity'. . . refers to a condition in which the natural structure and function of ecosystems [are] maintained." H.R. Rep. No. 92-911, at 76 (1972); see also Minnehaha Creek Watershed Dist. v. Hoffman, 597 F.2d 617, 625 (8th Cir. 1979). The legislative history of the Clean Water Act, in turn, defines "natural" as "that condition in existence before the activities of man invoked perturbations which prevented the system from returning to its original state of equilibrium." H.R. Rep. No. 92-911, at 76. "Any change induced by man which overtaxes the ability of nature to restore conditions to 'natural' or 'original' is an unacceptable perturbation." H.R. Rep. No. 92-911, at 77.

[6]These two comments raise a general question regarding the monitoring of stormwater discharge. As noted, stormwater runoff from the waste rock reaching waters of the U.S. would not be permitted. In other words, it would be a violation. NDEP should require monitoring of this runoff. However, we recognize the difficulties inherent with this recommendation. Sampling ephemeral flow requires someone to be onsite and observant at odd times coincident with a storm.

13-30 The comment misconstrues the scope of the Clean Water Act, which expressly defers to the states' authority to allocate quantities of water [33 U.S.C. §1251(g)]. The Clean Water Act is directed at protecting water quality through the regulation of pollutant discharges into waters of the U.S. BMG has obtained the necessary permits and authorizations from the Nevada State Engineer's Office for the water it plans to use in connection with its proposed dewatering operations. Discharges of pollutants to waters of the state would be regulated by a water pollution control permit issued by the NDEP. As the comment points out, the Draft EIS did fully evaluate under NEPA the potential environmental impacts to Willow Creek and other surface waters that may result from the proposed dewatering operations. The BLM does not believe that the Proposed Action, as mitigated, would violate state or federal water quality laws.

According to Congress, a primary goal of the CWA is to maintain the natural structure of streams. Such an interpretation is supported by case authority which holds that the "Clean Water Act should be construed broadly to encompass deleterious environmental effects of projects." Riverside Irrigation Dist. v. Andrews, 568 F. Supp. 583, 588 (D. Colo. 1983), aff'd 758 F.2d 508 (10th Cir. 1983). Dewatering a live stream violates the natural structure of the stream. See Dubois v. U.S. Department of Agriculture, 102 F.3d 1273, 1294 (1st Cir. 1996), cited above. In this case, it is clear that the elimination of Willow Creek does not "maintain the natural structure and function of the ecosystem" in that watershed. Thus, the drying of the stream and loss of habitat violates both state and federal laws.

Under the CWA, states must adopt water quality standards for all water bodies within the state. 33 U.S.C. § 1313.

> These standards include three components: (1) designated uses for each body of water, such as recreational, agricultural, or industrial uses; (2) specific limits on the levels of pollutants necessary to protect those designated uses; and (3) an antidegradation policy designed to protect existing uses and preserve the present condition of the waters.

National Wildlife Fed'n v. Browner, 127 F.3d 1126, 1127 (D.C. Cir. 1997) (citing 40 C.F.R. §§ 131.10 - 131.12).

13-30 "A water quality standard defines the water quality goals of a water body, or portion thereof, by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses." 40 C.F.R. § 131.2. EPA implementing regulations define designated uses of water as "those uses specified in water quality standards for each water body or segment whether or not they are being attained." 40 C.F.R. § 131.3(f). The minimal designated use for a water body is the "fishable/swimmable" designation. See 33 U.S.C. § 1251(a)(2).

Willow Creek is a Nevada listed class B water. NAC 445A.125. The relevant Nevada standards follow:

> 1. Class B waters include waters or portions of waters which are located in areas of light or moderate human habitation, little industrial development, light-to-moderate agricultural development and where the watershed is only moderately influenced by man's activity.
> 2. The beneficial uses of class B water are municipal or domestic supply, or both, with treatment by disinfection and filtration only, irrigation, watering of livestock, **aquatic life and propagation of wildlife**, recreation involving contact with the water, recreation not involving contact with the water, and industrial supply.
> 3. The quality standards for class B waters are:
> Item Specifications
> (...
> (e) pH. Range between 6.5 to 8.5.
> (f) Dissolved oxygen. **For trout waters, not less than 6.0 milligrams/liter; for nontrout waters, not less than 5.0 milligrams/liter.**
> (g) Temperature. **Must not exceed 20 C for trout waters or 24 C for nontrout waters.** Allowable temperature increase above natural receiving water emperatures: None.
> ...
> (i) Total phosphates. Must not exceed 0.3 mg/l.
> (j) Total dissolved solids. Must not exceed 500 mg/l or one-third above that characteristic of natural conditions (whichever is less).

NAC 445A.125, emphases added.

In that a beneficial use of Class B waters is the propagation of fish and wildlife, the following aquatic life standard is relevant: "The water must be suitable as a habitat for fish and other aquatic life existing in a body of water. This does not preclude the reestablishment of other fish or aquatic life." NAC 445A.122(c). For the propagation of wildlife, an additional standard is: "The water must be suitable for the propagation of wildlife and waterfowl without treatment." NAC445A.122(h).

13-30 Willow Creek contains brook, brown and rainbow trout. DEIS at 3.5-4. Decreasing flow rates in a stream, including the complete dessication of the stream, violates Nevada state water law by decreasing the available habitat. Decreasing flow would also decrease the dissolved oxygen content and increase the temperature in violation of relevant standards. Temperature increases would occur because at base flow most streams shrink in depth more than width (relatively constant width/depth ratio). The heat loading through the stream surface remains constant while the volume being heated shrinks considerably. Decreased flow also changes the pool:riffle ratio, usually by decreasing the length and velocity of riffles. This often leads to sediment and fines build-up on the stream bottom. This could decrease or eliminate spawning habitat. Thus, any significant drying of the stream renders it unsuitable as habitat for fish and for the propagation of wildlife which therefore violates Nevada State law.

As noted above, many waters that will be severely degraded or outright dried-up by the operations are classified for beneficial uses by the State of Nevada. The U.S. Supreme Court has squarely held that:

> The text [of the CWA] makes it plain that water quality standards contain two components. We think the language of § 303 is most naturally read to require that a project be consistent with *both* components, namely, the designated uses *and* the water quality criteria. **Accordingly, under the literal terms of the statute, a project that does not comply with a designated use of the water does not comply with the applicable water quality standards.**

PUD No. 1 of Jefferson County v. Washington Department of Ecology, 511 U.S. 700, 714-715, 114 S.Ct. 1900 (1994)(italics emphasis in original, bold emphasis added).

13-31 The dewatering also violates federal antidegradation regulations. According to federal regulation, applicable antidegradation policies "shall, at a minimum, be consistent with . . . [e]xisting instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected." 40 C.F.R. § 131.12(a)(1). Under this regulation, "'**no activity is allowable . . . which could partially or completely eliminate any existing use.**'" PUD No. 1, 511 U.S. at 718-19, 114 S.Ct. at 1912 (emphasis added)(citing EPA, Questions and Answers on Antidegradation 3 (Aug. 1985)). Therefore, the antidegradation policy must be implemented in a manner consistent with the existing uses of all streams. Any activity which would even *partially* eliminate those uses is not permitted.

Under the CWA, the minimum designated use for navigable water is the "fishable/swimmable" designation, which "provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water." 33 U.S.C. § 1251(a)(2). But the protection is not limited to streams which support fish: A water body composed of solely plants and invertebrates is also protected under the antidegradation policy. Bragg v. Robertson, 72 F. Supp.2d 642, 662 n.38 (S.D. W. Va. 1999) (citing EPA, Water Quality Standards Handbook § 4.4) (vacated on other grounds, (April 24, 2001, 4th Circuit)). Under federal regulations, limited degradation is permitted only where (1) the quality of the water exceeds levels necessary to support the fishable/swimmable use designation, and (2) the quality of water necessary to protect all existing uses is maintained. 40 C.F.R. § 131.12(a)(2).

13-31 Please see the response to comment 13-30.

Letter 13 Continued

13-31 By dewatering the streams, which by their very nature could not then support the existing aquatic life, the operations would violate the stream standards and antidegradation policy. The quality and quantity of water necessary to protect existing aquatic life and other designated uses **must** be maintained. See 40 C.F.R. § 131.12(a)(2). Because dewatering all or portions of these streams would essentially turn the relevant portions of live streams into dead streams, incapable of supporting plants, fish and other wildlife, the operations cannot be authorized.

Furthermore, in light of the likelihood that the operations cannot comply with state water quality standards, the BLM Plan of Operations (PoO) approval decision would violate Section 313 of the Clean Water Act. Section 313 requires compliance with "all Federal, State, interstate, and local requirements" for the discharge or runoff of pollutants on federal land. 33 U.S.C. § 1323. This section places a duty on federal agencies to comply with federal CWA requirements, in addition to state water quality standards. Additionally, CWA § 313 applies to both point source and nonpoint source discharges on federal land. See, e.g., Oregon Natural Desert Assoc. v. Dombeck, 172 F.3d 1092, 1098 (9th Cir. 1998) ("§ 1323 ... directs federal agencies 'engaged in any activity which may result in the discharge or runoff of pollutants' to comply with applicable water quality standards. 33 U.S.C. § 1323(a).").

Presumably NAC445A.121 extends standards to other waters, including Galena Canyon and its tributaries. Thus, dewatering and discharges, whether through seepage or through surface drainages, would also be illegal.

The evidence is undisputed that all or portions of streams will be eliminated due to the operations currently under review by the BLM. Under FLPMA, the 3809 regulations, and the Clean Water Act, these operations cannot be approved. All mining operations "shall comply with applicable Federal and State water quality standards...." 43 CFR § 3809.2-2(b). Moreover, under BLM regulations "[f]ailure to comply with applicable environmental protection statutes and regulations thereunder will constitute unnecessary or undue degradation." 43 CFR § 3809.0-5(k). Failure to prevent "unnecessary or undue degradation" mandates rejection of a mining plan of operations. "If there is unnecessary or undue degradation, it must be mitigated. See 43 CFR 3809.2-1(b). If unnecessary or undue degradation cannot be prevented by mitigating measures, BLM is required to deny approval of the plan. 43 CFR 3809.0-3(b)." Kendall's Concerned Area Residents, 129 IBLA 130 (1994).

13-32 The DEIS suggests that augmentation of the stream will suffice. DEIS at 3.2-87. Augmentation whereby water is pumped into the stream does not maintain the riparian functionality which depends on the groundwater flow to the stream. Pumping water or tapping an artesian source near the stream will just perpetuate the problem. The only real mitigation for the dewatering is reinfiltration of the water which will be discussed below in the alternatives sections.

The discussion above suffers from a lack of actual flow data. The DEIS should include the measurements completed by Baker Consultants in their report referenced as 1997a.

13-33 **The BLM cannot authorize the degradation or appropriation of Public Water Supplies**

As noted herein in these comments, the DEIS admits that a number of perennial springs and waterholes will be eliminated or severely degraded by groundwater pumping and drawdown. "As present in Table 3.2-14, there are 10 inventoried perennial springs located within (or near) the predicted Phoenix Project drawdown area." DEIS at 3.2-48. The DEIS assumes that any springs flowing from August through October are perennial and dependent on groundwater and will probably be affected by the dewatering of this project. Many of these

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13-32 Comment noted. Flow augmentation is both technically and hydrologically feasible. If properly implemented, flow augmentation would sustain flows and the associated riparian habitat in lower Willow Creek. Please see the response to comment 2-4 regarding baseline flow data.

13-33 Only springs or water holes on public land having the characteristics sufficient to satisfy the purposes of Public Water Reserve No. 107 are covered by the Executive Order. In addition, only that amount of flow necessary to serve the domestic and stock watering purposes of the reservation is reserved. In any event, as discussed in Section 3.2.4 of the EIS and set forth in mitigation measure WR-3, BMG would be required to monitor these springs for potential impacts and to take appropriate mitigation measures if mine-related impacts are observed, which may include augmentation to maintain flows.

Letter 13 Continued

springs or waterholes are reserved for public use by Public Water Reserve No. 107 (Executive Order of April 17, 1926). According to the IBLA:

> Assuming that the water is a spring and is on public land it would be subject to the Executive Order of April 17, 1926, establishing Public Water Reserve No. 107. The Executive Order withdrew all springs and water holes on public lands and the surrounding acreage [smallest legal subdivision or all lands within one quarter mile for unsurveyed lands]. It was designed to preserve for the general public lands containing water holes and other bodies of water needed or used by the public for water purposes.

Desert Survivors, 80 IBLA 111, 115 (1984).

13-33 Under this Executive Order, the BLM cannot authorize activities that will impair the public use of any of those waters. In this case, the BLM's approval of dewatering and other activities that could dry up any springs or waterholes on public land would be illegal. This is especially true since the DEIS admits that many of these springs are currently used for stockwatering and other public purposes. Therefore, the BLM can only approve operations that will protect the water levels and uses of these springs. It should be noted that this withdrawal is still valid and was not rescinded by FLPMA.

In addition, this Executive Order prevents Newmont/BMG from appropriating any of the reserved waters. These waters are held pursuant to a federal reserved water right and can only be used for the purposes of the reservation – i.e. public watering uses. *See* Cappaert v. United States, 426 U.S. 128, 145 (1976)(federal reserved water rights derive from federal reservations, and "are not dependent upon state law or state procedures"). Removing the water from these springs as a result of the groundwater withdrawals and dewatering is prohibited. The BLM can only approve an alternative that avoids interfering with these federal reserved water rights.

13-34 It is not necessary for a spring to be perennial to be connected to or dependent on the regional groundwater as assumed by the BLM. Springs may depend on a seasonal rise to intersect with the ground level or for an artesian spring to gain enough pressure to discharge at the ground surface. Thus, if dewatering affects the levels in an area of ephemeral springs, it is possible to affect their discharge. This suggests that merely considering the extent of a ten-foot drawdown cone at various time periods is insufficient; seasonal differences may extend that ten-foot drawdown substantially further than maps on Figure 3.2-13-16[7].

The reclamation bonding estimates are too low

13-35 The heap closure estimates may have been underestimated. The power costs for circulating water appears to be a significant underestimate. The power cost estimate of $663,527 for circulating water through the heaps (rinsing) for 3.36 years is too low. It works out to just $16,456/mnth. We were told that the Olinghouse Mine, on going bankrupt, was spending close to $80,000 per month for power just to keep the water circulating through the heaps. The Olinghouse heap is substantially smaller than the Phoenix heap. This suggests the power costs are seriously underestimated. The time for detoxification, 3.36 years, requires justification as well. There is no discussion of time for detoxification in the DEIS but there is recognition of the need to rinse or treat until WAD cyanide reaches 0.2 mg/l. DEIS at 2-44,45. The 3.36 years should be justified. At the Candelaria Mine, the effluent still had high WAD cyanide levels after several years.

[7]This comment does not consider the efficacy of using the ten-foot drawdown cone. On small springs and seeps, minor changes in head will cause significant changes in flow. On minor springs, dewatering effects may be small and ephemeral, but very significant to the ecology of the region. We suggest that the BLM consider using the 5-foot drawdown contour for considering impacts on springs.

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13-34 Ephemeral streams and springs in this region are generally believed to be controlled by surface runoff and localized near-surface storage and release of surface runoff that persists for short periods after precipitation events. The seasonal nature of these surface water occurrences suggests that they are not sustained by discharge from a ground water aquifer. Conversely, baseflow in perennial streams and springs (as defined in the EIS) is dependent on the discharge of ground water from either a regional or localized perched aquifer system. For these reasons, the BLM believes it is unlikely that any of the ephemeral streams and springs located within the drawdown area would be affected by mine-induced drawdown.

13-35 The reclamation bond cost estimate has been reviewed by the BLM and NDEP and has been determined to adequately address all costs associated with the closure of the heap leach facilities. The rinsing time of 3.36 years was calculated based on a 4,667 gpm capacity of the activated carbon treatment system minus the evaporative loss of water of approximately 10 percent. Laboratory studies conclude that approximately 1 ton of water (240 gallons) is needed to adequately rinse 1 ton of ore. There are an estimated 34,377,000 tons of ore to be rinsed, taking approximately 3.36 years.

The power costs are determined by the price at which the operator purchased power and applied to 3.36 years of pumping. If the rate of $0.06/kilowatt hour changes, then the new estimate would be reflected in the updated reclamation surety. BMG is required by NAC 519A.380 to update the reclamation surety within 3 years of Plan of Operations approval and for each following 3-year period.

Letter 13 Continued

13-36 There are similar concerns with the interim SIX MONTH INTERIM FUID MANAGEMENT PLAN COMPONENT COSTS provided on sheet 36. Here the power cost is $137,894 for six months, or $22,982. Part of the difference is due to using $0.07/kwh for the interim fluid management estimate and $0.06/kwh for the reclamation plan.

13-37 The amount of ore use in the reclamation cost estimate is less than the amount of leach grade ore specified in the DEIS. According to the reclamation plan, there will be 34,377,000 tons of leach grade ore to be detoxified. Reclamation Plan, Heap Leach Pad Sheet A. DEIS Table 2-2 shows that 48,278,000 tons of leach grade ore will be moved. (That number is the sum of all the amounts shown in the column titled Leach Grade Ore.) That is approximately 1.4 times the ore used in the reclamation cost estimate. Scaling the Total Heap Rinsing Cost of $1,955,351 to account for this extra ore indicates the estimate should be closer to $2,746,035.

13-38 We agree that phasing the bonding is legal. However, it is not calculated correctly. Phase 1 includes cost for backfilling just the Minnie Pit. Reclamation Cost Estimate Summary for Phase 1 of the Phoenix Project, Sheet 10. The plan for this mine includes the backfill of existing pits. This backfill is necessary, according to the proposed action, to prevent undue degradation caused by the formation of pit lakes. Because this is an essential part of this plan and is necessary to prevent UUD, backfilling existing pits should be bonded at the beginning of the project. The estimates for backfilling pits **must include** the cost of completing the cap that will decrease long-term seepage. See the next paragraph regarding bonding for the waste rock facilities.

13-39 The amounts of reclamation bonding for the waste rock dumps appears to be insufficient as well. The following table breaks down the costs by acre (revegetated acre, not the horizontal acre):

Facility	Area (ac)	Total Cost ($)	$/acre
Butte Canyon	29.6	262994	8884
Iron Canyon N	52.3	468351	8958
Iron Canyon S	74.3	755,052	10162
Iron Canyon E	39.8	367412	9231
Box Canyon	69.6	682586	9807
Natomas	165.7	1658395	10008

These numbers are commensurate with values seen at other mines, but are low because of the thickness of the cap that must be included[8]. In the southern region, Kuipers found that costs per area for waste rock dumps varied from less than $1000/acre to about $7000/acre while the upper limit of the range in the northern region was closer to $50,000/acre. The highest estimate is at the Gilt Edge mine in South Dakota where an engineered cover was bonded for $43,940/acre. The cover consisted of an 18-inch low permeability soil layer or geosynthetic clay layer under a 12-inch coarse drainage layer under a 36-inch spent ore protective cover under a 4-6 inch topsoil cover. Except for the geosynthetic clay layer and the drainage layer, this is similar to that being proposed here. At the Zortman-Landusky mine, the total bond is about $70,000,000. Kuipers at III-49. Ignoring the synthetic line, the cost of reclaiming the 105 acre waste rock dump is 1,600,000. Kuipers at III-53. Because half of this area of waste rock dump will actually be used to backfill the pit, the reclaimed waste rock area will be approximately 55 acres and the cost will be about $30,000/acre. This involves spreading a two layers: 2.2 feet of non-acid generating rock and 1.3 feet of topsoil. In other words, the bond per acre is three times as much as the Phoenix bond and provides for spreading just 3.5 feet, not 5.0 feet of cover. Similar numbers are found at other acid producing sites where significant barriers are included on the

[8] The numbers from other mines cited in this paragraph come from Kuipers, J.R., 2000. Hardrock Reclamation Bonding Practices in the Western United States, prepared for National Wildlife Federation, Boulder CO. Center for Science in Public Participation, Boulder, MT. This study relied on case studies for many mines around the West. Hereinafter referred to as Kuipers.

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13-36 A cost of $0.07/kwh is consistent with fluid management plan component costs used to calculate a bond for the 6-month interim fluid management plan. This is an NDEP requirement with BLM concurrence. Please refer to the Reclamation Cost Estimate for Phase 1 of the Phoenix Project (Brown and Caldwell 2000b) for 43 §CFR 3809 bonding cost estimates.

13-37 The reclamation cost estimate for the Phoenix Project includes existing disturbance from previous plans of operations and the projected disturbance during the first 3 years of Phoenix Project operations. The heap rinsing cost estimate presented on Heap Leach Pad Sheet A of the Reclamation Cost Estimate for Phase 1 of the Phoenix Project (Brown and Caldwell 2000b) includes costs for rinsing 34,377,000 tons of ore. This amount includes the 24,000,000 tons of ore that currently exist on the leach pad plus 5,828,000 tons of ore projected to be mined during the first 3 years of the extraction schedule (Table 2-2 of the EIS), plus an additional 4,549,000 tons of ore included as a buffer in the event that the results of actual mining activities result in higher volumes of leach-grade ore. The 48,278,000 total tons of ore is the volume of ore that BMG will have added to the existing heap leach pad over the 28-year mine life.

13-38 BMG proposes to backfill the pits to optimize materials handling throughout the life of the Phoenix Project and to minimize surface disturbance. Existing pits have encountered small amounts of ground water but pit lakes would not exist under the Proposed Action. Therefore, life-of-mine bonding for pit backfilling is not necessary until the pits are either developed or expanded. The Phoenix Project disturbance and concurrent reclamation occur in operational phases; the bond coverage would be adjusted to cover each phase of an operation as it progresses.

The estimated cost to reclaim each waste rock facility includes the volume of material needed based on 5 feet of cover material over the surface area, time required, equipment, labor, fertilizer, and seed. The BLM, with the NDEP's concurrence, has determined that the phased bonding has been correctly determined, in accordance with the revised 43 CFR §3809 regulations and Nevada BLM Bonding Policy.

13-39 The cost estimate for each waste rock facility incorporates the placement of 5 feet of cover material. Environmental conditions influence the cost of reclaiming waste rock facilities, as the commenter notes. Arid conditions in Nevada do not require the same design criteria for covers as waste rock facilities in higher precipitation zones. Clay layers, for instance, would be ineffective in most arid regions. The estimated cost to reclaim waste rock facilities at the Phoenix Project reflects site-specific environmental conditions.

Letter 13 Continued

13-39 waste rock facilities. The calculations for reclaiming waste rock facilities at Phoenix must be reconsidered or significant justification for the estimates should be provided in the EIS.

13-40 The cursory analysis of the bonding presented here indicates that the Phoenix project, as proposed, is grossly underestimated. The BLM, in consultation with the Nevada Division of Environmental Protection, must revisit this estimate.

13-41 **Newmont does not have the financial resources to complete this project while protecting the other resources**

Newmont has been losing money for a couple of years. According to the Rocky Mountain News, "Denver-based Newmont Mining Corp. recorded a net loss of nearly $19 million, or 11 cents a share, in 2000 because of low gold prices and one-time charges, the company said Wednesday."[9] The red ink continued in 2001. "Newmont on Tuesday reported a net operating loss of $5.5 million, or 3 cents per share, in the first quarter, ..."[10] Newmont's financials have the investment community concerned. The following are excerts from Investest Report by Merrill Lynch & Morgan Stanley, Dean Witter (emphases added).

> "For 2001, while we look for higher equity gold production as a result of the acquisition of the Battle Mountain Gold assets, we anticipate Newmont's cash costs will also increase. If this proves accurate, it will mark the first time since 1996 that NEM's cash costs increase relative to the prior year. In addition to rising energy costs in the U.S and higher processing costs in Peru, we believe **the addition of the former Battle Mountain Gold assets will also have a negative impact on NEM's 2001 overall production costs.**"

> "In our opinion, higher energy costs in the U.S., higher processing costs in Peru, and the **addition of the higher-cost Battle Mountain Gold assets will combine to result in an 8.2% increase in cash costs** in 2001."

> "Newmont is **over-leveraged** in a low gold price environment, in our view. Higher energy prices, particularly in Nevada, could also cause total cash costs to rise anywhere from US$3-4/oz by our estimate"

> "Newmont is the largest North American-based gold producer. With more than 5.1 million equity ounces of gold production forecast in 2001, and virtually no hedging in place, **we think Newmont is very exposed to a changing gold price**. For example, **each US$10/oz move in the gold price impacts its revenue by US$51 million** (US$0.28 per share). Newmont is also financially leveraged. We estimate its **net debt to be about $1.1 billion.** This leverage provides good upside to a rising gold price. For instance, we estimate that a 10% change in the gold price impact Newmont's net asset value by 41% (US$10.96 per share) and a 33% change in 2001 forecast cash earnings."

The investment community worries that Phoenix will increase Newmont's costs.If the price of gold drops by 10% ($27), Newmont's revenues will drop by over $100,000,000. If Newmont is in the middle of this project when this drop occurs, there will be substantial concerns over their ability to continue. This is a major concern in light of the underestimated bonding discussed in the previous section.

[9]DROP IN GOLD PRICES HAS NEWMONT CORP. AT A LOSS , ROCKY MOUNTAIN NEWS (Denver CO), February 8, 2001, Thursday.

[10]Low gold prices mean tough times for Newmont, Rocky Mountain News (Denver, CO), May 2, 2001.

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13-40 The BLM, with concurrence from the NDEP, has determined that the bond cost estimate is sufficient to cover 100 percent of the cost of reclaiming the proposed disturbance. The cost estimate has been determined to be in accordance with the revised 43 CFR §3809 regulations and Nevada BLM bonding policy.

13-41 Newmont is the world's second largest gold producer and North America's largest. Newmont's total assets are more than $3.5 billion (Newmont 2000 Annual Report). The BLM will require appropriate financial assurances to be in place prior to project initiation to ensure that funds are available for site reclamation and protection of environmental resources.

Letter 13 Continued

The No Action Alternative Is Illegal

13-42 This mine is one of the few projects we've ever reviewed where the no action alternative definitely has significant drawbacks regarding water quality. Throughout, the description of the existing conditions and the conditions that will occur resulting from the closure of the existing mine indicate a site that is severely degraded. The description and citations provided above shows that the existing conditions violate Nevada water pollution standards and regulations and the Clean Water Act. The two-foot cap on the waste rock facilities would be insufficient for preventing seepage from the waste rock.

The resultant pit lakes will violate Nevada standards and will cause groundwater degradation. The ponded water with low pH and high metal concentrations that "disappeared from the P-1 Pit in late 1998" likely seeped into the shallow groundwater resulting in subsequent degradation. DEIS at 3.2-77. Poor water quality in the Fortitude pit will flow into downgradient groundwater at 40 gpm. Id. If it violates standards, it will degrade groundwater. The prediction that the Minnie Pit will fill to 19 feet with acidic water also indicates that degradation will occur. Id. It is unlikely that the Minnie Pit will continue to drain as suggested because the observed "spontaneous drainage" may have been associated with ephemeral groundwater conditions or with surface inflow. Once the regional groundwater rises above the pit bottom the lake will remain. Of course, a shallow lake as this may be intermittent which may be more of a water quality problem. Every time it drains, the contaminated water may provide a source of contaminants to downgradient water.

Thus, as is the case with the proposed action, the BLM may not select the No Action alternative because it will cause undue or unnecessary degradation.

The long-term monitoring plan is too short

13-43 The DEIS is very confusing in that it refers to the state of Nevada requirements that limit monitoring to 30 years. DEIS at 3.2-87. Analysis presented in this DEIS and supporting documents shows that this is much too short. Id. The maximum sulfate loading will not reach groundwater for 100 years if the wetting front model is accurate, ie if preferential flow does not substantially speed the process. This shows the inadequacy of the state regulations, but it should also be noted that there is nothing in the Nevada statutes that limit it to 30 years. It is faulty rulemaking by the Environmental Commission that has led to this unworkable limit. That said, the BLM must require longer term monitoring and treatment plans. **The BLM must change the word "may" in the paragraph on page 3.2-87 to "shall"**. Because the BLM has predicted degradation will occur, there can be no choice provided regarding long-term monitoring.

That said, it is good that the BLM and Newmont/BMG provided a long-term management plan. But the next section shows that it is insufficient.

The long-term groundwater management plan is insufficient to protect groundwater

13-44 The incredibly high levels of sulfate loading caused by seepage through the waste rock dumps has led the BLM to require a long-term groundwater management plan. DEIS at 3.2-87,88. The analysis is lacking because it leads to which leads to a plan that will not capture the high sulfate groundwater. The statement in the first paragraph is just wrong: "This Plan demonstrates that potentially affected groundwater can be effectively managed by hydraulic pumping controls and conventional water treatment practices and technologies." Contingent Long-Term Groundwater Management Plan at 1.

The plan is insufficient is because it ignores fractures in bedrock during its analysis. The analysis uses MODFLOW to simulate the hydraulics and create a series of hydraulic head surfaces. At 3. "Particles were

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13-42 The BLM disagrees that the No Action alternative would be illegal. Existing conditions would continue to be managed by BMG, in cooperation with appropriate agencies and as required by current permits and approvals (see Section 2.3.2 of the EIS, Continuing Operations, Closure, and Reclamation). Please also see the response to comment 13-5.

13-43 The BLM agrees that long-term monitoring would be necessary for the Proposed Action and that a 30-year postclosure monitoring time frame is probably not sufficient. For these reasons, mitigation measures WR-5 and WR-6 (Section 3.2.4, Monitoring and Mitigation Measures), provide for long-term, postclosure, unsaturated zone and ground water monitoring for use in detecting potential impacts to ground water quality and for implementing the Contingent Long-term Groundwater Management Plan, if necessary. As stated in WR-6, this monitoring would continue until the potential risk of ground water contamination has been shown to be minimal as determined by the BLM in coordination with other applicable agencies. Please note that the language used for all mitigation measures will not be final until the BLM issues the Record of Decision for the project.

13-44 The description of the numerical flow modeling in Section 3.2.2.1 explains that MODFLOW was originally designed to simulate flow through porous media. In order to use this model, it was assumed that ground water flow in the fractured networks within the bedrock aquifers could be treated (for analytical purposes) as an equivalent porous media. The assumption of an equivalent porous media is supported by extensive pump test and water level data provided by Baker Consultants, Inc. (1997a). In addition, MODFLOW and other codes originally designed for porous media flow have been used to evaluate potential mine dewatering impacts to water levels in fractured rocks aquifers in numerous other mines in northern Nevada, including the Betze Project SEIS (BLM 2000c), South Pipeline Project Draft EIS (BLM 1999a), Twin Creeks Mine Final EIS (BLM 1996a), and Round Mountain Mill and Tailings Facility Final EIS (BLM 1996d).

The comment stating that "*The fact that significant pressure was found in exploration bore holes near the Fortitude pit indicates that there is a lack of connection among fracture sets*" is misleading and incorrect. The hydrogeologic conditions in the vicinity of the Fortitude Pit (and the other existing and proposed pits in the Copper Canyon area) have been investigated in the field through extensive monitoring and aquifer testing. The rocks in the Fortitude Pit area contain interconnected fracture sets. As explained in Baker Consultants, Inc. (1997a), the Virgin fault located in the eastern portion of the pit is an important north-south trending, hydrostructural feature that contains low-permeability materials that restrict ground water flow across the fault. The ground water model represents this fault as a narrow, low-permeability zone that restricts the movement of ground water between bedrock blocks on either side of the fault. In addition, the calibrated model simulates the effect of this hydrostructural feature on the ground water flow system. In summary, the ground water model simulates the hydraulically interconnected fracture systems on either side of the fault and the variable head conditions across the Virgin fault. The model was calibrated to observed fluctuations in ground water elevations that occurred during aquifer testing and during 2.5 years of dewatering the Fortitude Pit. The steady-state and transient calibration results (Baker Consultants, Inc. 2000a) demonstrate that the model provides a reasonable representation of the ground water flow system in the fractured rock aquifers.

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13-44 released into the transient flow field from source areas within the waste rock facilities to determine whether early solute breakthrough would cause particles to move in different directions than those predicted under later groundwater conditions." Id. Thus, the solute follows the nice path predicted by MODFLOW head levels. The MODFLOW analysis is correct for porous media, which bedrock is not. The contaminant flow will be controlled by the fracture flow. As the leading text on groundwater modeling puts it regarding fractured media:

> Forming a conceptual model of a fractured system requires either a **gross simplification** or a **detailed description** of the aquifer properties controlling flow. A fractured medium consists of solid rock with some primary porosity cut by a system of cracks, microcracks, joints, fracture zones, and shear zones that create secondary porosity and form a network for flow when interconnected....Secondary permeability can increase the effective hydraulic conductivity of a fractured rock system up to **five orders of magnitude** depending on the type of material and the number, width, and interconnection of the fractures.[11]

The authors do indicate that fractures can be analyzed using an equivalent porous medium (EPM). This is what the contractors did here, whether they realized it or not. The flow parameters "are selected so that the flow pattern in the EPM is similar to the flow pattern in the fractured system."[12]. Because fractures in seismically altered rock usually trend in one direction, the hydraulic properties of an EPM in different directions often differ. In other words, there is often a very high horizontal anisotropy in an EPM. There was no indication that that was the case in this analysis. "An EPM approach assumes that the fractured material can be treated as a **continuum** and that a representative elementary volume (REV) of material characterized by effective hydraulic parameters can be defined."[13] The continuum concept is very important. If fracture systems are not connected, then the head in a volume being simulated by a model cell may differ between systems. In reality, pumping (to capture contaminants or for dewatering) may capture flow from one system and lower the head significantly throughout it without touching the other system. The fact that significant pressure was found in exploration bore holes near the Fortitude pit indicates that there is a lack of connection among fracture systems. Anderson and Woessner suggest that the EPM method may not be appropriate in some instances. "When fractures are few and far between and the unfractured block hydraulic conductivity is low, the EPM method may not be appropriate even with a large REV."[14] Based on the low flow rates seen here, it is likely that these problems exist and the EPM is inappropriate. In conclusion, Anderson and Woessner state that "all three of the conceptual models discussed above require assumptions that **vastly oversimplify** the actual fractured system."[15]

13-45 Because of the problems with the analysis, it is necessary that the prescriptions handle the uncertainties. The contractor recognized that fracture flow would affect the attenuation expected in the geochemical modeling. "Because most proposed waste-rock facilities are underlain by bedrock containing fractures with a low surface area-to-volume ratio, it was assumed that no additional attenuation of sulfate or acidity would be achieved once percolating water from the waste rock enters the bedrock system." At 12. They need to include certain methods to capture and prevent the flow from reaching downgradient locations. Regardless of the density of the monitoring system, it is unlikely and probably impossible to get monitoring wells in each of the fracture systems through which extremely high contaminant loadings could be moving. Unfortunately, Newmont BMG appears to have ruled out the only method that can work: slurry walls or grout currents.

[11] Anderson, M.P. and W.W. Woessner, 1992. Applied Groundwater Modeling: Simulation of Flow Advective Transport. Academic Press. San Diego. At 328-329.
[12] Id., at 329.
[13] Id., emphasis added.
[14] Id., at 331
[15] Id., at 332.

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13-45 As stated in the previous response, the ground water model provides a reasonable representation of the ground water flow system and predictions of changes to the ground water flow system that are likely to occur as a result of the proposed mining activities. Therefore, the BLM does not agree that there is a problem with the analysis. The ground water monitoring, aquifer testing, observations during dewatering, and ground water modeling mutually support the concept that ground water flows through fracture networks within bedrock blocks, and identified north-south trending fault zones tend to restrict the movement on either side of the faults. The calibrated ground water flow model was used to evaluate and optimize the locations of ground water extraction wells to capture dissolved solutes that are predicted to eventually migrate from the waste rock facilities. The modeling indicated that it would be feasible to capture ground water that could eventually be affected beneath the waste rock facilities (Brown and Caldwell 2000c). The proposal to use extraction wells to capture potentially affected ground water is based on currently available technology that has been successfully applied to control or mitigate ground water impacts at numerous sites (including both porous sediments and fractured bedrock) located throughout the U.S. It is important to recognize that although the BLM believes there are sufficient data to determine the feasibility of using hydraulic pumping controls to capture affected ground water, the BLM also recognizes that the final location, number, depth, and pumping rate for the ground water extraction wells required to accomplish the goals of the Contingent Long-term Groundwater Management Plan will need to be determined based on the actual hydrogeologic conditions encountered during initial aquifer testing and monitoring accomplished for final design of the extraction system.

The comment concludes that "*a cutoff wall is the only design that will work to protect ground water.*" Two types of cutoff walls are commonly constructed by: (1) excavating a trench and backfilling the excavation with a low-permeability mixture (slurry wall), or (2) driving an interlocking section of sheet pile. Slurry walls are typically constructed through soil-like materials by excavating from the surface using a large backhoe or excavator; the depth of the slurry walls is limited by the depth capability of the excavation equipment. Sheet pile walls are constructed by driving steel sheets from the surface. Sheet piles can be driven through soil and weak bedrock materials, but they usually do not extend more that 100 or 150 feet. BMG's proposed interceptor cross-sections require the installation of rows of extraction wells that extend to depths ranging from 300 to 900 feet in hard bedrock material. It is not feasible to install the cutoff walls described above to depths of 300 to 900 feet in hard bedrock material.

Creating a grout curtain is another option suggested in the comment. Grout curtains are constructed by injecting grout through a series of boreholes penetrating the fractured zone. Grout curtains are commonly used to reduce (but not completely eliminate) ground water flow through shallow fractured bedrock foundations beneath dams. Unfortunately, grout curtains tend to leak since it is not possible to get full penetration of the grouting fluid throughout the fracture zones. In addition, it appears impractical or technically infeasible to install grout curtains that extend up to 900 feet in depth and thousands of feet laterally. In addition, grout curtains historically have been known to break down or become less effective with time.

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"Systems evaluated by BMG and BCI varied from physical barriers (i.e., excavated bentonite slurry walls, injected grout curtains, reactive barriers) to physical groundwater extraction well systems to contain and capture dissolved solutes in groundwater. Due to physical restraints (i.e., fracture depth, bedrock vs. alluvial material, etc.) associated with the bedrock hydrologic system, physical barriers were eliminated from further consideration. Therefore, several different extraction well locations and configurations were evaluated, which allowed development of an optimized hydraulic capture system." At 3.

13-45

"Interception of groundwater at each facility along this flow path was demonstrated to be inefficient because groundwater would be more effectively captured and removed from the system downgradient rather than simply removing incremental solute loads as it passes beneath each new facility along the flow path. Therefore, intercept locations were identified in the Phoenix Project area to optimize capture and minimize groundwater removal from the bedrock system." At 5

But the uncertainties associated with fractures show that pump and capture techniques will not capture and probably not even most of the flow. A cutoff wall is the only design that will work to protect groundwater.

The analysis in this DEIS violates NEPA and CEQ requirements

The entire NEPA process for Phoenix Project was based on an erroneous assumption that all the lode and millsite claims were valid and could be legally used. However, these assumptions lack any support in the record and in fact is directly contradicted by the admission that the ancillary facilities are to be located on lode claims that do not contain "mineable ore." Such "rights" limited the BLM's discretion to protect public lands,
13-46 for example, by locating mine facilities on nearby private lands.

As held by the Interior Department in the March 25, 1999 *Crown Jewel Mine Decision*, "selection of an alternative is valid only insofar as the unpatented mining claims and mill sites are valid." *Decision* at 5. At Phoenix, this means that the BLM should have fully reviewed the alternative of locating ancillary facilities off of public land. Indeed, the BLM must ensure the protection of public land from facilities proposed on invalid claims.

Even if the BLM is not **required** to locate ancillary facilities off public land, the failure to adequately review
13-47 this alternative violates NEPA. The BLM also ignores that its primary duty is to "prevent unnecessary or undue degradation" of public lands. Moving ancillary facilities off federal lands will undoubtedly protect these lands.

Secondly, the fact that the proposed action is designed such that the Project utilizes existing facilities is not a valid justification for rejecting a viable alternative. The Project applicant's "design" is only a **starting point** for the BLM's duty to review alternatives – it cannot be a determinative factor in the analysis and selection of alternatives.

13-48 The consideration of alternatives is "the heart of the environmental impact statement." 40 CFR § 1502.14. It is absolutely essential to the NEPA process that the decision-maker be provided with a detailed and careful analysis of the relative environmental merits and demerits of the proposed action and possible alternatives, a requirement that has been rightly characterized as the "the linchpin of the entire impact statement." NRDC v. Callaway, 524 F.2d 79, 92 (2d Cir. 1975). "The existence of a viable but unexamined alternative renders an environmental impact statement inadequate." Resources Limited v. Robertson, 35 F.3d 1300, 1307 (9th Cir. 1993) *(quoting* Idaho Conservation League v. Mumma, 956 F.2d 1508, 1519 (9th Cir. 1992)).

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Even if it were possible to install a cutoff to these depths in rock, ground water would mound and flow around the cutoff, unless the cutoff were extended around the perimeter of the facility in an attempt to completely isolate the ground water system beneath the waste rock facilities. If a cutoff were extended around an entire facility, ground water recharge to the cutoff zone would eventually raise water levels and require the installation of extraction wells to prevent ground water from intersecting the ground surface. In some instances, the creation of cutoff walls or grout curtains (without extraction wells to control head) could either result in new surface discharge areas, or restrict or eliminate ground water discharges in some locations. For these reasons, the BLM believes that the concept of installing cutoff walls or grout curtains to mitigate impacts associated with the waste rock facilities is either unfeasible or impractical compared to the proposed ground water extraction and treatment system. A brief discussion of these additional potential alternatives identified in comments on the Draft EIS has been added to Section 2.5.2 of the Final EIS.

13-46 The federal mining laws do grant the public certain rights to use public lands for mining purposes; however, the BLM does not typically conduct a validity examination on each involved mining claim when reviewing proposed plans of operations. The comment is incorrect in suggesting that the entire NEPA process was based on an assumption that the lands at issue are all covered by valid mining and millsite claims. The federal mining laws and the Federal Land Policy and Management Act give the BLM broad authority to approve and manage mining-related activities on public lands that have not been withdrawn from mining. The public lands included within the Phoenix Project Plan of Operations boundary have not been withdrawn from mining activities. As discussed in the response to comment 13-3, the BLM has considered a broad array of alternatives, including potentially locating certain ancillary facilities off of public lands.

13-47 As described in the Introduction in Chapter 1.0 of the EIS, BMG's Proposed Action is designed to integrate mining and beneficiation of new ore deposits with closure and reclamation of previously disturbed areas. Ancillary facilities were sited to provide environmental benefits as well as engineering feasibility. Due to the checkerboard land ownership configuration of private and public lands, it is not feasible, nor economically desirable, to locate all of the facilities on private land. The text in Section 2.5.2 of the Final EIS has been expanded to explain this issue.

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13-48 The DEIS for this project really only considered one approach: Newmont/BMG's proposal. The BLM created the illusion of alternatives in the DEIS by presenting variations of the company's proposal. The BLM attempts to perpetuate the illusion by adding an "Agency preferred alternative" to the DEIS, which again is simply the applicant's plan combined with various mitigation and other requirements the BLM apparently intends to impose on the company's implementation of its plan. During the process, the only alternative that received serious consideration was the one proposed by the company.

By doing so, the BLM misapprehends the whole idea of an EIS. NEPA cannot be satisfied by analyzing alternatives that are merely versions of each other. The point of NEPA's alternatives analysis is to compare the environmental impacts to public lands of different approaches to public land use. The critical off-public land or off-site facility alternatives were rejected due to vague references to costs associated with new facility construction.

13-49 At a minimum, a full analysis of the reasons for rejecting reasonable alternatives on economic grounds should have been included. To satisfy NEPA, "[t]he agency must explicate fully its course of inquiry, its analysis and its reasoning." Dubois v. U.S. Department of Agriculture, 102 F.3d 1273, 1287 (1st Cir. 1996). The DEIS does not satisfy this basic requirement. The agency has made no complete and independent analysis of the "cost" factors involved in rejecting various alternatives, or of the public interest, because it predetermined, without any independent analysis, that costs of other alternatives were unacceptable based on only a cursory analysis. In this case, the record is lacking as to the specific economic considerations that forced the rejection (or selection) of alternatives.

This is contrary to both NEPA and the APA which require that an agency's determinations be supported by factual information in the decision. "The agency must explicate fully its course of inquiry, its analysis and its reasoning." Dubois v. U.S. Department of Agriculture, 102 F.3d 1273, 1287 (1st Cir. 1996). An agency decision must always have a rational basis that is both stated in the written decision and demonstrated in the administrative record accompanying the decision. Kanawha & Hocking Coal & Coke Co., 112 IBLA 365, 368 (1990). The decision must be made in a "careful and systematic manner." Edward L. Johnson, 93 IBLA 391, 399 (1986). The record must demonstrate a "reasoned analysis of the factors involved, made in due regard for the public interest." Alvin R. Platz, 114 IBLA 8, 15-16 (1990). Where, as here, BLM has made no analysis of the "cost" factors involved or the public interest because it predetermined that such costs were unacceptable, then BLM's decision is unreasonable.

13-50 Even if the BLM could rely on future "corrective action" to mitigate those predicted water quality concerns, which we believe it cannot do, BLM must adequately review these mitigation measures in the DEIS. NEPA requires that mitigation measures be reviewed in the NEPA process -- not in some future decision shielded from public scrutiny. "[O]mission of a reasonably complete discussion of possible mitigation measures would undermine the 'action-forcing' function of NEPA. Without such a discussion, neither the agency nor other interested groups and individuals can properly evaluate the severity of the adverse effects." Methow Valley, 490 U.S. 332, 352, 109 S.Ct. 1835, 1847 (1989).

NEPA regulations require that an EIS: (1) "include appropriate mitigation measures not already included in the proposed action or alternatives," 40 CFR §1502.14(f); and (2) "include discussions of: . . . Means to mitigate adverse environmental impacts (if not already covered under 1502.14(f))." 40 CFR § 1502.16(h). In addition, under 40 CFR §1505.2(c), the agency is required to: "State whether all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted, and if not, why they were not."

According to the federal Council on Environmental Quality ("CEQ"), "[a]ny such measures that are adopted

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13-48 The BLM thoroughly considered a broad range of alternatives to the Proposed Action. As discussed in Section 2.5.2 of the EIS, BMG's initial proposed Plan of Operations was submitted to the BLM in August 1994. Through the NEPA scoping process, several alternative design and operational parameters were identified. Many of these were ultimately incorporated into the current Proposed Action because they were deemed to be environmentally beneficial and were both technically and economically feasible. These changes included backfilling open pits to eliminate pit lakes in the Phoenix, Iron Canyon, and Midas pits, and reducing the size of surface waste rock disposal facilities. As described in Section 2.5.2, the EIS also considers several other alternatives that would alter the size, location, and operation of various ancillary facilities such as waste rock disposal areas and heap leach pads. The EIS also evaluates in detail the No Action alternative, under which the Proposed Action would not be constructed. Additional potential alternatives suggested in comments on the EIS also have been addressed in the responses. The comment incorrectly suggests that the presence of existing mining facilities caused the BLM to reject other "viable alternatives." The existence of pits, waste rock areas, and heap leach pads on the site as a result of more than a century of mining activity were a factor that was considered in developing the Proposed Action and alternatives. Many components of the Proposed Action were designed to address and improve existing environmental conditions that have resulted from this historic disturbance. However, existing disturbance was not the only factor that the BLM considered in evaluating potential alternatives. As stated in Sections 2.5 and 2.5.1 of the EIS, several other factors were considered in developing potential alternatives, including potential environmental impacts, other physical constraints, technical feasibility, economic feasibility, land tenure, and the applicant's purpose and need for the Proposed Action.

13-49 The BLM did not eliminate alternatives from detailed consideration in the EIS based upon a "predetermination" that the economic costs of those alternatives were unacceptable to the applicant. Instead, as discussed in the response to comment 13-48, the BLM considered several factors in evaluating potential alternatives, not the least of which was the potential environmental impacts of the alternatives. As discussed in Section 2.5.2 of the EIS, several potential alternatives were eliminated from detailed consideration because the BLM concluded that the alternative would not provide any measurable environmental benefit, and in many cases had the potential for greater impacts. The reasons for excluding various alternatives from detailed consideration are summarized in the EIS. A discussion of additional potential alternatives identified in comments on the Draft EIS has been included in the responses to those comments and to Section 2.5.2 of the Final EIS.

13-50 The BLM disagrees that the EIS does not adequately discuss potential mitigation measures. Several mitigation measures were incorporated into the Proposed Action during the scoping process. For example, BMG would be required to implement a Contingent Long-term Groundwater Management Plan to address potential impacts to ground water quality from the waste rock facilities. The EIS identifies additional mitigation measures for each resource that would potentially be impacted by the Proposed Action. These include specific measures to address potential impacts to surface and ground water quality (see Section 3.2.4). Other appropriate mitigation measures identified during the NEPA process will be prescribed as a condition in a Record of Decision issued by the BLM.

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13-50 must be explained and committed in the ROD." Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18026, 18036 (March 23, 1981). That has not been done in this case. Relying on unverified and as-yet undocumented and undeveloped mitigation measures fundamentally flaws the DEIS.

The BLM relies on vague, untested, and unproven mitigation measures. The most egregious example involves the predicted violations of ground and surface water standards noted herein and in the DEIS. Failure to analyze, let alone briefly mention, substantive mitigation for the water quality problems violate CEQ NEPA regulations. *See* 40 CFR §§ 1502.14(f), 1502.16(h), and 1505.2(c). Unfortunately, these mitigations are just statements that Newmont/BMG or the government will review an issue later and submit an as-yet-undetermined study or plan. Such a process violates NEPA and cannot stand. For critical water quality mitigations, the DEIS simply states that Newmont/BMG and the BLM will review the issue after the close of the NEPA process (e.g., during future development of the water treatment plans, water and wildlife mitigations, etc.). Such after-the-fact review is impermissible.

13-51 **Alternative Project Design**

The project as proposed has problems with waste rock oxidizing and producing AMD into both surface and groundwater. Dewatering associated with the project will affect springs and streams for several miles from the site. The current proposal is to backfill pits and rely on the burying of oxidizable material to protect the groundwater. It relies on potentially faulty assumptions of oxidations rates and oxygen flow to suggest that all oxidation products will be locked in the waste rock facilities. Dewatering water is used for milling.

13-52 We propose a few changes to the existing proposal. Consideration of this in detail would help to remedy the NEPA problems dealing with lack of alternatives discussed in the previous section. We support backfilling the pits if water can be prevented from reaching the waste rock. In other words, rising groundwater levels must be prevented from reaching the rock. The pits after backfill must be kept dry. This can be accomplished in either of two ways. The groundwater inflow is small and probably results from fracture flow. The fractures should be grouted to prevent inflow. On e potential problem with this is the head that would be applied to the grout; it is possible that the grout would "blow out" as the water levels increase. Because grouting works (or at least is intended to do so) to prevent seepage around and under dams or to prevent seepage into deep underground mines, we believe that Newmont is capable of making this work. The second way is by grouting the backfill. Essentially, this would turn the backfill into a slurry which would harden and prevent water from reaching the rock. This is similar to the slurry backfill used in underground mines. This would only be necessary for the backfilled waste rock beneath the maximum projected water table. This would essentially replicate the pre-existing bedrock, except that fractures would not exist.

13-53 The project should be scaled back the project as well. Because the rock becomes more acid-producing with depth, the deeper Newmont goes the more potential problems it encounters. This proposed action will produce about 5,000,000 ounces of gold along with substantial silver and copper along with over 900,000,000 tons of waste rock. The Waste Rock Report mentions that earlier incarnations of the project would have moved less than 200,000,000 tons of rock and had a much shorter plan of operations. (We have no information on the amount of minerals to be produced.) If the smaller project would have produced significantly more mineral per ton of rock moved, it may be desirable and more profitable for Newmont to forgo the deeper ore which comes with significantly increased acid production, more dewatering, and much more backfilling. This would decrease both the head problems and volume problems discussed in the previous paragraph.

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13-51 The BLM believes the project as proposed relies on reasonable assumptions about oxidation rates and oxygen flow within waste rock facilities. The modeling was conservatively set up to simulate the complete oxidation of all sulfides within each waste rock facility and the potential migration of those oxidation products to the ground water table.

13-52 The comment proposes that ground water be prevented from reaching waste rock in the backfilled pits by either: (1) grouting fractures in the pit wall to prevent ground water inflow, or (2) grouting the backfill. Please see the discussion of grout feasibility, effectiveness, and potential technical difficulties provided in the response to comment 13-45. In brief, grouting at dam sites (and also at underground mines) is used to reduce (but not eliminate) ground water flow since it is generally not possible to get the grout to penetrate all of the openings in a fractured rock material. In addition, flow across grout curtains often increases over time since the grout tends to break down. For this reason, the BLM believes it would be very difficult or technically infeasible to use grout injection to prevent ground water from flowing into the backfilled material. A brief discussion of these additional potential alternatives identified in comments on the Draft EIS has been added to Section 2.5.2 of the Final EIS.

In addition to the technical infeasibility, the cost would be prohibitive. The estimated amount of waste rock placed below the maximum projected water table elevation is presented in Table 13-52 below. Overall, there would be approximately 93,000,000 cubic yards of waste rock material placed below the maximum projected water table elevation (assumed to be 40 feet above the predicted final ground water elevation). Newmont has indicated that the cost to selectively handle this material, mix and add grout, and place this grouted material into the pits would likely average on the order of $20 per ton. Assuming that $20 per ton is a reasonable cost estimate, the total cost to grout the backfill material placed in the pits below the maximum ground water elevation would be on the order of $1.9 billion.

As stated in the response to comment 13-23 and summarized in the EIS, under the Proposed Action the backfilled waste rock would be amended up to the model-predicted upper confidence limit of the postmining ground water table. The rate of addition of chemical amendment to the submerged backfill would be calculated to provide sufficient neutralization capacity for all sulfide present in the waste rock. Capping and reclaiming the backfilled pits and amending the waste rock as proposed should minimize potential impacts to ground water quality associated with flow through the submerged waste rock. Furthermore, all backfilled pits would be upgradient of ground water interception locations specified in the Contingent Long-term Groundwater Management Plan (Brown and Caldwell 2000c); therefore, any unforeseen impacts to water quality resulting from the backfilled material would be mitigated, if needed, in accordance with this plan and mitigation measure WR-4 (Section 3.2.4). Therefore, the BLM believes that it is not necessary or reasonable to require grouting of waste rock material placed below the final water table elevation.

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Table 13-52
Wet Pit Backfill Requirements

Facility	Final Predicted GW Elevation (feet at msl)	Final Predicted GW Elevation Plus 40 Feet (feet at msl)	Wet Backfill Volume (cubic yards)	Wet Backfill Tonnage (tons)
Phoenix	6,020	6,060	71,686,982	121,151,000
Reona	5,230	5,270	7,239,738	12,235,157
North Midas	5,080	5,120	29,701	50,195
Middle North Midas	4,970	5,010	308,476	521,324
South Midas	4,900	4,940	13,671,401	23,104,668
			92,936,298	157,062,344

Notes
Final predicted ground water elevations taken from Table 4.3 of Baker Consultants, Inc. (2000a).
Wet backfill volume and tonnage includes 40 feet of thickness above the final predicted ground water elevation.

13-53 Please see the responses to comments 1-9 and 13-6 regarding analysis of a smaller project alternative. In addition, the ore-to-waste ratio for the original project, as proposed in the 1994 Plan of Operations, is similar to the current Proposed Action, which is a ratio of approximately 3:1.

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13-54 The other necessary change is that some of the dewatering water should be recharged between the site and Willow Creek to prevent the creek from drying. Note that the augmentation scheme discussed on page 3.2-87 is not sufficient because pumping water into a stream does not maintain the functionality of the riparian system (see discussion above).Based upon our review of the area, an infiltration basin will probably suffice if a large enough flat space can be found. This is acceptable even though it would increase the total pumpage from the groundwater systems reported in Table 3.2-6. The increase would come from a requirement to pump process water elsewhere. It is preferable to use water pumped on the flats in the Reese River drainage for milling than to completely dewater the upper portions of the watershed as the current proposal does. The FEIS should analyze in the groundwater model the effects of reinfiltration on the changes in water level. However, any such replacement water must be of a very good quality so as not to degrade the stream–a condition that does not appear to met by the evidence.

13-55 Finally, the extant surface waste rock dumps currently produce significant AMD and are contaminating ground and surface waters in the region. Newmont/BMG proposes to cover the old and new facilities with a five-foot cover of crushed, net neutralizing waste rock. DEIS at 2-43. The Waste Rock Report analyzes the water balance properties of the cover and predicts the amount of seepage that will occur. There is no topsoil layer to be added and the vegetation is expected to take hold in crushed rock. See DEIS at 2-39-41. Note there is no description of how the waste rock will be crushed and placed; the FEIS should remedy this. The water balance model of the cover relies on vegetation to transpire water and prevent seepage into the underlying waste rock. We propose a different cover design that must be analyzed as part of the alternatives. The cover should still be five feet thick, but the crushed waste rock layer, on top, should be just 3.5 feet thick. Must covers on waste rock and heaps throughout Nevada will be only 2 feet and they assume that the roots will reach only that depth. This decreased thickness should not affect rooting or the plans throughout the rest of Nevada are premised on a false assumption. Beneath that should be a coarse gravel layer one foot thick. It could also be crushed neutralizing waste rock. This would provide a vapor barrier that prevents seepage from going below the 3.5 foot level during normal and dry years. Capillary action "holds" the water in the overlying layer. Under the gravel layer, there should be a 6 inch clay layer designed to have permeabilities similar to the liner under a heap. This would prevent "break-through" seepage from reaching the underlying acid-producing waste rock. So that the gravel layer is not "flooded" during extremely wet years, there should be a drain system, similar to that under a heap, to collect the drainage. It would be collected and discharged at a downgradient point. It could be land applied or preferably discharged into the ground in a French drain type of design. It is not possible to argue that this is infeasible because the BLM relies on similar impermeable layers under heaps and tailings to prevent seepage in perpetuity. The BLM will rely on the collection system under heaps throughout Nevada to collect heap draindown and seepage and move it to leachfields in perpetuity. Finally, the leachfields are expected to work in perpetuity, without regular maintenance. If the BLM or Newmont/BMG argue that this system will not work in perpetuity, then it would be disingenuus to propose it to handle heap seepage. If the cover layer is truly neutralizing, the quality of the water to be discharged should be good.

13-56 Finally, the top foot of the 3.5 foot layer should be amended with organic matter to improve germination and growth.

Comments on the Analysis of Groundwater

13-57 The DEIS discusses recharge estimates based on the Maxey-Eakin methodology. This method may lead to significant errors in the analysis for this project. The Maxey-Eakin method was developed as a prediction of the total recharge estimated for a basin. The method was essentially a regression analysis of estimated recharge with the proportion of the watershed receiving different levels of precipitation. An implicit assumption, without considering geology, is that a certain proportion of the precipitation will become recharge. However, the estimated recharge was based on a water balance solution for basins

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13-54 The EIS indicates that drawdown resulting from ground water pumping for mine dewatering could result in reduced flows and possibly reduce the length of the lower perennial reach of Willow Creek. Mitigation measure WR-3 (in Section 3.2.4) specifies that continuous surface and ground water monitoring would be conducted to detect and trigger the preparation and implementation of a detailed, site-specific plan to enhance or replace the affected perennial water resources. Flow augmentation is one of several options that would be considered in the site-specific plan. As stated in the response to comment 13-32, the BLM believes that it is feasible to mitigate impacts to Willow Creek using flow augmentation. The comment suggests that some of the dewatering water be used to recharge the ground water system between the site and Willow Creek to prevent potential impacts to flows in Willow Creek; the comment also suggests that water could be pumped from the Reese River Valley (located several miles east of the mine) to supply water for use in the mine operation. There are several problems associated with this proposal. Under the Proposed Action, all of the water extracted during mine dewatering would be used in the mining operation. Since the dewatering wells would dewater the ore zones to be mined in the open pits, it is likely that these waters would contain high total dissolved solids and naturally elevated concentrations of metals (as described under the heading "Groundwater Quality" in Section 3.2.1.3) and therefore, may not be suitable for recharge to the alluvial ground water system that supports perennial flows in Willow Creek. Also, additional ground water pumping would be required for mine use to offset any mine dewatering water used for reinfiltration. Pumping water from the Lower Reese River Valley and delivering it to the mine would require: (1) water rights for ground water extraction in the Lower Reese River Valley, and (2) approval to transfer water from the Lower Reese River Valley Hydrographic Basin to the Buffalo Valley Hydrographic Basin. Any interbasin transfer would need to be approved by the State Engineer, who is responsible for administering water rights. In addition, the proposed supplemental pumping in the Lower Reese River Valley Hydrographic Basin would result in additional drawdown impacts including potential impacts to water supply wells and surface water resources in this basin. Pipeline construction also would cause additional ground disturbance and the associated impacts. For the reasons stated above, the BLM does not believe that this alternative would provide environmental advantages.

13-55 The objective of the cover design suggested in the comment is to prevent water from infiltrating. The critical element of the cover design described in the comment is a 6-inch clay layer that would, "…prevent seepage from reaching the underlying acid-producing rock." This type of engineered cover system has been used extensively with relatively high success in wet climate regions such as Canada. In wet climates where there is sufficient moisture to keep the clay layer hydrated, the clay serves as a barrier to both oxygen diffusion and infiltration. In a dry climate such as Nevada, covers that include a compacted clay layer have a high potential for failure because of drying and cracking (Morris et al. 1992; Swanson et al. 1997). When the clay layer dries and cracks (due to volumetric shrinkage), infiltrating water flows through the shrinkage cracks to the acid-generating waste rock material below. The shrinkage cracks also serve as conduits for oxygen diffusion. Because of the high risk of failure of this type of cover system in a dry climate, the BLM does not consider the alternative cover design described in the comment to be a reasonable or desirable alternative. Also, please see the response to comment 13-10 regarding the cap material.

13-56 As indicated in Section 2.4.21.4 of the EIS, amendment needs would be evaluated and, if necessary, "incorporated with the seedbed substrate to enhance nutrient content and microbial populations."

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13-57 wherein all discharges were measured or estimated and storage changes were accounted for. The remainder was recharge which could have occurred at any point in the watershed such as from losing streams and at the mountain front where the streams disappear into alluvial fans as discussed in the DEIS. DEIS at 3.2-23. Thus, it is incorrect to assume that recharge occurs in the distribution described on page 3.2-24. See the discussion and assumptions used in the groundwater model prepared by MacDonald-Morrissey Associates for Barrick Goldstrike Mines in their supplemental EIS.

This could lead to large errors in the dewatering and recovery predictions in the DEIS because of the low dewatering requirements relative to the actual recharge. Irregardless of the discussion in the previous paragraph, much recharge occurs in the mountains and canyon bottoms above the site. Recharge in these higher elevation locations flows toward the mine facilities where dewatering removes it. Thus, dewatering at rates of 2000 to 4000 gpm (3200 to 6400 af/y) is essentially all of the natural precipitation recharge in the basin above the dewatering. Table 3.2-6, DEIS at 3.2-24. Where it occurs (in the groundwater model) controls the predicted impacts. Presumably, inflow to pit lake or to backfilled pits will be of a similar magnitude.

Because of the similar magnitude of annual recharge and dewatering rates, the year-to-year variability cannot be ignored. Unfortunately, the groundwater model does not consider the potential variability caused by annual recharge variations.

The sediment and retention in basins the Iron and Butte Canyon drainages may also affect recharge amounts to the Reese River basin by preventing flow into the stream, allowing it to evaporate, and causing any recharge to occur at a different location. DEIS at 3.2-67. The impacts of this must be considered in both the water balance analysis and the groundwater model.

The waste rock facilities decrease this recharge in perpetuity because of the cap (if it works). "Construction of the Proposed Action waste-rock facilities over the existing waste-rock and copper beneficiation facilities would cut off current recharge through the existing material, reducing groundwater recharge and depressing the water table beneath the facilities". Waste Rock Report at 44. As a part of the analysis of recharge, it would be interesting to consider how the predicted rates compare with Maxey-Eakin, and then to predict infiltration at the sites without the waste rock dumps. This may be a better estimation of the effects of the waste rock dumps.

13-58 **Hydrologic Conditions Update**: This section provides comments specific to the hydrology report completed by Baker Consultants and referenced below as Hydro Report[16]. The uncertainties highlighted illustrate the problems with this project. That ground water elevation changes in response to recharge differs with elevation reflects the small basin area in which recharge occurs. It is expected that, when recharge amounts are a high proportion of the total aquifer storage, levels will change rapidly. The temporally sparse monitoring missed a good opportunity to learn much more about the aquifer conditions.[17] However, Baker is to be commended for adjusting the calibration to reflect what was learned from this high recharge. Future monitoring should reflect the extreme temporal nature observed here.

The observed flow from the exploration boreholes indicates that the hydrologic conditions in the area are

[16]Baker Consultants, 2000. Addendum to Baseline Hydrologic Characterization Report, Phoenix Project, Lander County, Nevada. March 15, 2000. Prepared for Battle Mountain Gold Co.. Wheat Ridge, CO.

[17]"It is possible that water levels in some wells reached peak values between June and December and that the December levels represent a declining leg of the recharge season. Hydro Report at 2-6. This statement indicates that significant hydrologic information regarding lag times and flow rates has been missed.

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13-57 The Maxey-Eakin method (Maxey and Eakin 1948) for estimating recharge to ground water basins has been applied to over 200 basins in Nevada and many other basins in western states. It has been used extensively for water resource studies in Nevada conducted by both the Nevada Department of Conservation and Natural Resources, and the USGS. Avon and Durbin (1994) performed an evaluation of the Maxey-Eakin method that included a statistical comparison between Maxey-Eakin recharge estimates and independent estimates of recharge using other methodologies. The results of the evaluation indicated that "the Maxey-Eakin method provides estimates of recharge that are generally in good agreement with independent estimates." Therefore, the BLM does not agree that the method is incorrect as implied in the comment. The methodology used by MacDonald-Morrissey Associates to estimate recharge for the hydrologic model used to predict impacts associated with dewatering and water management activities at the Goldstrike Mine appears to be another different, but acceptable method for estimating recharge (BLM 2000b).

13-58 Comment noted. Please see the following responses to specific comments about the Baseline Hydrologic Characterization Report (Baker Consultants, Inc. 1997a). The BLM believes that the Water Resources Monitoring Plan in conjuction with Monitoring and Mitigation Measures WR-1, WR-3 and WR-4 are sufficient to identify and mitigate such impacts.

Letter 13 Continued

13-58 very complex. The presence of artesia pressure so close to a pit that has been dewatered for years indicates that future pit construction will intersect pressurized faults and/or layers. It is essential that the spring, seep and groundwater monitoring plan reflect the possibility that flow to these sources may be cut off. The discussion from page 2-16 through 2-18 just accentuates the concern. The information in section 2.6 and Table 2.8 does not provide much insight into the potential effects of cutting off a source.

13-59 The report correctly calculates the pit lake inflow as being from 140 to 165 gpm but fails to note that this depends on the lake level. Hydro Report at 2-13. This is true because flow to the lake obeys Darcy's law. As gradient increases, so does the flow velocity. Therefore, lower lake levels increase the gradient which increases flow velocities. Of course, the effective wall area decreases and the hydraulic properties vary with wetted thickness. Therefore, transmissivity, which changes with lake level, affects the flow rate as well. The report should discuss this and consider how this affects the predictions of future hydrologic conditions.

13-60 The component of "change in lake volume" for the water balance equation uses the wrong sign. Hydro Report at 2-8, 9. The equation indicates correctly that negative indicates a loss from the lake. Hydro Report at 2-9. However, the water balance shown in Table 2.6 labels the storage change negative when the water surface elevation increases which occurs only when there is a positive change in storage.

13-61 The report indicates that groundwater inflow to the Fortitude Pit lake was revised in early 2000 by back-calculating from estimates of all the other water balance components with the results presented in Table 2.6. Hydro Report at 2-13,14. This is not true because Table 2.6 only extends through 1998.

13-62 **Groundwater Model**: Before commenting on the substance of the model, I'd like to say that the documentation provided by Baker is some of the best I've seen in reviewing models for mines around Nevada. Appendix B is helpful in showing information concerning conductivities, layer thicknesses and boundaries, with one exception.

13-63 The exception regards the "prescribed head" boundaries shown on figure B-18. In MODFLOW there are two packages: a constant head (CHB) and a general head boundary (GHB). (The river and stream packages are a modification of the general head boundary package.) The differences are large. The constant head package is a specified head boundary which must be used with caution because it provides an "inexhaustible supply of water" if the head near the boundary changes[18]. The GHB package allows the head to change, and is therefore a head-dependent flow boundary[19]. Because the boundaries around this region clearly are not inexhaustible water sources, a GHB is much more appropriate. If the "prescribed head" is actually a constant head, Baker should provide proof that the inexhaustible flow did not limit the extent of the drawdown cones below. They could do this by publishing the CHB flows with time. This would be best in map form to show whether flow across the boundary changes with time (which would be due to stress (dewatering) induced head changes). The GHB allows a modest increase in flux, as would be expected, as the head near the boundary drops.

13-64 In addition, Baker should publish the parameters of the boundaries, including the river or stream boundaries. There is no discussion about how rivers or streams are modeled.

13-65 The difficulties Baker has with choosing a steady state scenario for calibration reflects once again the small watershed size. Even without human made stresses, natural recharge and ET fluctuations provide

[18]Anderson, M.P. and W.W. Woessner, 1992. Applied Groundwater Modeling: Simulation of Flow Advective Transport. Academic Press. San Diego. At 106.

[19]Id., at 99.

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13-59 Comment noted. The calculations discussed on page 2-13 are supported by the data in Table 2.5 of the Addendum to the Baseline Hydrologic Characterization Report (Baker Consultants, Inc. 2000a). Examination of the pit lake elevation range in each of the four filling events indicates that for each event the lake level increased and decreased over approximately the same elevation range. To provide a higher degree of confidence in the model results, these events were incorporated into the model calibration.

13-60 Comment noted. The sign for the of the "Change in Lake Volume" as a rate (cfd) component is reversed in Table 2-6 in the report.

13-61 Comment noted. The calculations were performed in 2000, but only for the period from the third quarter of 1996 through the fourth quarter of 1998.

13-62 Comment noted.

13-63 As discussed in the Baseline Hydrologic Characterization Report (Baker Consultants, Inc. 1997a), constant head boundary conditions were determined to be appropriate and, therefore, were used in the model simulations. Detailed information about model boundaries is presented Section 5.2.2, Boundary Conditions, in the Baseline Hydrologic Characterization Report (BHCR) (Baker Consultants, Inc. 1997a). Also, refer to the tables in Appendix D where a small change in the boundary flux is documented, though it is considered insignificant.

13-64 This information is available on pages 5-10, 5-17, and 6-3 in the BHCR (Baker Consultants, Inc. 1997a).

13-65 The BLM recognizes the uncertainties associated with the ground water flow model. However, as indicated above, the model provides an acceptable understanding of potential hydrologic effects that may be caused by the Phoenix Project.

Letter 13 Continued

13-65 substantial stresses. Because observation wells were generally nonexistant at the time mining and dewatering began, there is no real representation of natural conditions. Baker may have done the best they could. However, the BLM must recognize the huge uncertainties inherent in all of predictions.

13-66 Because there are stresses occurring in 1996, the steady state calibration period, it should be discussed whether there is any pumping in the model runs.

13-67 Accepting the conditions on the steady state analysis, Baker should publish the rationale for the "calibration criteria that at least 90 percent of control points be matched within ±40 feet". Hydro Report at 3-6, specified again at 3-7,8. Typically, the acceptable range depends on the range of heads model domain. Similar comments apply to Baker's assertions that the mean error and root mean square error are acceptable. Hydro Report at 3-7. (Note that the mean error is irrelevant because high positive residuals offset high negative residuals to yield a mean error equal to zero.)

13-68 Regardless of the acceptable ranges, it is important to assess trends in residuals across the model domain. Our primary concern in this regard is that wells in Willow Creek have high negative and positive residuals. CP21, the furthest upstream well, has a -12.23 residual. This appears to be next to the upper reservoir. Because the calibrated is less than the measured head, it is important to assess whether the water table actually connects with the stream water surface at this point. CP23 residual is -17.01. This well is on the side of the canyon. Because observed levels are greater than calibrated, it is likely that natural head levels slope more steeply toward the stream than modeled. The calibrated conductivity is therefore probably too high. During the predictive phase, this probably limits the extend of the drawdown cone development. Conversely, wells CP29 and 30 show positive residuals with heads close to the ground surface which suggest their heads are too closely controlled by the stream. If the model simulates a connection with the stream that exceeds reality, the extent of the drawdown cone development could also be impeded. As part of the calibration, Baker should publish the modeled fluxes from/to the river boundaries and springs (see next paragraph).

13-69 Springs do have heads that exceed the ground surface if they are discharging on to the surface and it is true that unless there is an observation well, it is impossible to know the value of the head at that point. Hydro Model at 3-6. For this reason, springs should be modeled with a drain package (similar to the river package, but water can only leave the model) rather than as a level observation point. Hydro Model at 4-3. The calibration should attempt to match the observed spring flow. To do this, the head would be above the ground surface, although the analyst should limit this to no more than a few tens of feet. This is particularly important in this complicated geologic area. (Note also that Table 3.1 should show the range of spring residuals because of the complicated hydrologic nature of each.) Using drain nodes at the springs would allow predicted effects and not require a reliance on the ten-foot drawdown cone. Hydro Report at 4-4.

13-70 Baker uses an automated calibration routine to set conductivities. Based on the maps, it appears that conductivity varies from cell to cell so that there are gradual variations across the domain. This is very appropriate in alluvial aquifers, but their use in bedrock and around faults is questionable. This is because aquifer material may change quickly across faults or other boundaries while the calibration subroutine will blend the conductivity. Residual changes across a fault may change from positive to negative as result.

13-71 It is also unclear to what extent Baker relied on faults in the analysis. Figure B-18 shows faults, but there is no discussion in the report. It would be useful to know the conductivity of the faults. In MODFLOW horizontal flow may be impeded by a fault which lowers the HCONT value between adjoining cells. In

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13-66 Pumping effects were included in the model simulation. Please refer to page 5-13 in the BHCR (Baker Consultants, Inc. 1997a) for modeling details.

13-67 The mean error is a commonly used measure of model calibration (Anderson and Woessner 1992, page 238). The plus or minus 40 feet criterion was established in the Hydrologic Characterization Work Plan (Baker Consultants, Inc. 1996) after review and discussion with the BLM. Please refer to Sections 4.0 and 5.0 in the BHCR (Baker Consultants, Inc. 1997a) for additional information about the model. The calibrated model has been accepted by the BLM as a reasonable representation for observed baseline conditions in the study area.

13-68 In ground water systems such as the one at the Phoenix site, ground water hydraulic gradients are often relatively steep, and a residual of 10 or 20 feet can have little influence on the gradient or ground water flux in a given steep gradient area. In this ground water system, residuals of greater than plus or minus 40 feet are acceptable in some areas. However, if mine-related effects to Willow Creek were detected during monitoring, then appropriate mitigation would be required as described in mitigation measures WR-3 and WR-4.

13-69 Comment noted. Unless the precise hydraulic relationship between a specific spring and the underlying potentiometric surface is known, selecting one modeling approach over another in simulating potential effects on the spring from mine dewatering or other stresses does not produce greater confidence in the simulated result. Empirical monitoring of ground water elevations adjacent to potentially affected springs within the simulated 10-foot drawdown contour provides an acceptable level of confidence regarding the hydraulic relationship. Also note that Table B-1 in the EIS lists all well and spring residuals.

13-70 Comment noted. Please see Sections 4.3 and 4.6, page 5-9, and Table 5.2 in the BHCR (Baker Consultants, Inc. 1997a) for a discussion of fault zone representation in the model.

13-71 Please see the response to comment 13-70.

Letter 13 Continued

13-71 this way, observed head drops can be modeled. In places where residuals have the problem discussed in the previous paragraph, the model would be improved through the use of low conductivity faults.

13-72 During the transient calibration, selected wells track the observed values well except for well CM-47. At this well, the observed values move up and down by tens of feet. The model fails to reproduce these changes. This high elevation well lies just north of the Fortitude Pit. The observed changes are probably due to seasonal fluctuations caused by recharge which the model does not adequately account for.

13-73 The inability of the model to simulate detailed fluctuations throughout the site suggest that predictions based on the model will miss important things. In other words, without a good seasonal accuracy which is shown herein, drawdown may cause intermittent or seasonal changes at springs, streams and wells that are not and can not be simulated herein.

Regarding the predictions of the future, we have two questions.

13-74 1. What are the hydraulic properties of the backfill? How are they added to the model? Is the model started and stopped at each point of adding new backfill, or hydraulic property zones in MODFlOW parlance, to the model?

13-75 2. What length of stress periods, time steps and expansion factors were used in the model?

13-76 3. Were the estimated dewatering rates determined as the flow to the drains beneath the pit lakes? This information should be added as a table to the groundwater report.

13-77 The predictions for model years 25 and beyond raise several questions and issues. Hydro Report at 4-9-11. The first is that after mining ceases, groundwater recovers to levels that exceed the 1996 baseline level in the alluvium south of the site. Hydro Report at 4-10,11, Figures 4-3B to G and certain DEIS figures. This must be explained.

13-78 The decline of the groundwater level beneath waste rock facilities is also interesting. Presumably, this is primarily due to the decreased recharge caused by the covers on the dumps. The report should discuss this and provide the recharge rates actually modeled. Presumably, the recharge rates vary with time as the wetting front takes some years to reach the base of the waste rock facility after seeping through the cover. Why does water surrounding the waste rock site not flow toward this drawdown? The report should provide a water balance for the aquifer beneath the dumps that shows horizontal flow from the four directions.

13-79 When the 10-foot drawdown contour reaches within two miles of the northern boundary, it is appropriate for Baker to raise the issue of the effects that the boundary may have on the model results. Hydro Model at 4-11. Rather than stating that "their effects on the model results are expected to be extremely small or negligible", they should do a quick assessment. Hydro Model at 4-11. The report should provide a time series of the northern boundary flux to determine whether the drawdown pulls water across the boundary. We note that Figure B-18 indicates that most of the boundary is appropriately no-flow, therefore there should be no flux[20]. If there is, it indicates problems with the model. They could also assess whether the drawdown substantially changes the head at the boundary.

[20] Note that in the copy we received, Table 4.5, which provides a time series of water balance for the model, was missing.

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13-72 Well CM-47 is completed in a small, isolated structural block in which greater hydraulic head fluctuations were observed than in adjacent blocks, apparently due to local recharge conditions.

13-73 As previously stated, the calibrated model provides a good simulation of historic ground water elevations and, therefore, its use for predicting ground water effects associated with the Phoenix Project is reasonable. Monitoring, along with required mitigation during the life of the project and thereafter would ensure that springs and stream flows are not adversely affected.

13-74 Backfill hydraulic conductivity and specific yield were modeled at 10.4 feet/day and 0.25, respectively. Backfill was added to each pit at the beginning of ground water recovery for each given pit, which coincides with the initiation of the following model run.

13-75 Please see the following tables for a summary of this information:

BMG Model Basic Time Step Information 7/9/01
Table 13-75a. No Action Alternative

Model Year	Model Elapsed Time (Years)	Model Run No.	Time Modeled (Years)	No. Stress Periods	No. Time Steps	Multiplier Used
	1Q 1999	1	0.25	1	5	1.05
	2-4Q 1999	1	0.75	1	20	1.05
	2000	1	1	1	40	1.05
1	2001	2	1	1	30	1.05
2-3	2002-2003	3	2	1	40	1.05
4-5	2004-2005	4	2	1	30	1.05
6-11	2006-2011	5	6	1	60	1.0
12-48	2012-2048	6	37	1	111	1.0
49-73	2049-2073	7	25	1	50	1.0
74-98	2074-2098	8	25	1	50	1.0
99-148	2099-2148	9	50	1	50	1.0
149-198	2149-2198	10	50	1	50	1.0
199-398	2199-2398	11	200	1	200	1.0
399-498	2399-2498	12	100	1	150	1.0
499-698	2499-2698	13	200	1	300	1.0
699-998	2699-2998	14	300	1	200	1.0

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BMG Model Basic Time Step Information 7/9/01

Table 13-75b. Proposed Action Alternative

Model Year	Model Elapsed Time (Years)	Model Run No.	Time Modeled (Years)	No. Stress Periods	No. Time Steps	Multiplier Used
1	2001	1	1	1	12	1.0
2	2002	2	1	1	12	1.0
3	2003	3	1	1	12	1.0
4	2004	4	1	1	12	1.0
5	2005	5	1	1	12	1.0
6	2006	6	1	1	12	1.0
7	2007	7	1	1	12	1.0
8	2008	8	1	1	12	1.0
9	2009	9	1	1	12	1.0
10	2010	10	1	1	12	1.0
11	2011	11	1	1	12	1.0
12	2012	12	1	1	12	1.0
13	2013	13	1	1	12	1.0
14	2014	14	1	1	12	1.0
15	2015	15	1	1	12	1.0
16	2016	16	1	1	12	1.0
17	2017	17	1	1	12	1.0
18	2018	18	1	1	12	1.0
19	2019	19	1	1	12	1.0
20	2020	20	1	1	12	1.0
21	2021	21	1	1	12	1.0
22	2022	22	1	1	12	1.0
23	2023	23	1	1	12	1.0
24	2024	24	1	1	24	1.0
25	2025	25	1	1	48	1.01
26	2026	26	1	1	48	1.01
27	2027	27	1	1	12	1.0
28	2028	28	1	1	12	1.0
29	2029	29	1	1	24	1.1
30	2030	30	1	1	12	1.1
31	2031	31	1	1	12	1.1
32	2032	32	1	1	12	1.1
33	2033	33	1	1	12	1.1
34	2034	34	1	1	12	1.1
35	2035	35	1	1	12	1.1
36-37	2036-2037	36	2	1	20	1.1
38-39	2038-2039	37	2	1	20	1.1
40-41	2040-2041	38	2	1	20	1.1
42-43	2042-2043	39	2	1	20	1.1
44-45	2044-2045	40	2	1	20	1.1
46-50	2046-2050	41	5	1	20	1.1
51-60	2051-2060	42	10	1	20	1.1
101-110	2101-2110	45	10	1	10	1.05
111-112	2111-2112	46	2	1	10	1.05
113-122	2113-2122	47	10	1	30	1.05
123-140	2123-2140	48	18	1	30	1.05
141-160	2141-2160	49	20	1	50	1.0
161-180	2161-2180	50	20	1	30	1.05
181-200	2181-2200	51	20	1	30	1.05
201-220	2201-2220	52	20	1	30	1.05
221-240	2221-2240	53	20	1	30	1.05
241-260	2241-2260	54	20	1	30	1.05
261-280	2261-2280	55	20	1	30	1.05
281-300	2281-2300	56	20	1	30	1.05
301-320	2301-2320	57	20	1	30	1.05
321-340	2321-2340	58	20	1	30	1.05
341-360	2341-2360	59	20	1	30	1.05
361-460	2361-2460	60	100	1	30	1.05
461-500	2461-2500	61	40	1	12	1.05
501-700	2501-2700	62	200	1	60	1.05
701-1000	2701-3000	63	300	1	90	1.05

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13-76 Yes; the sum of the flows to drains within each pit is summarized in Table 4.2 of the BHCR (Baker Consultants, Inc. 1997a).

13-77 Ground water elevations recover to levels that exceed baseline conditions in specific portions of the model domain because those areas were stressed by ground water pumping prior to and during baseline conditions. Postmining ground water elevations would reach a dynamic steady state affected by recharge rates through reclaimed waste rock facilities.

13-78 The recharge rates through reclaimed waste rock facilities are described in the hydrochemical report prepared by Exponent (2000a) and were used as input parameters for the calibrated ground water flow model. All aspects of ground water flow beneath the waste rock facilities are described by the model simulations summarized in the hydrochemical report (Exponent 2000a) and the BHCR (Baker Consultants, Inc. 1997a). For example, the contour elevation maps provided in the hydrologic report (Baker Consultants, Inc. 1997a) summarize the short- and long-term effects of mine dewatering and waste rock facility construction on the potentiometric surface. Whether one views the modeled effects resulting from a cone of depression created by, or a reduction of recharge through, the waste rock facilities does not alter the simulation results.

13-79 As the reviewer notes, the northern boundary of the model is represented as a no-flow boundary in the areas where a ground water divide exists; therefore, there is no flow across the model boundary. The drawdown contours presented for the 200- and 400-year Proposed Action results demonstrate that there is no significant impact of the northern boundary representation on the drawdown predicted north of the Phoenix Project area.

Letter 13 Continued

13-80 In conclusion, the hydrologic analysis and groundwater modeling show a system controlled by the annual amounts and seasonal distribution of recharge and complex fault and aquifer systems. Water levels change by tens of feet from year-to-year because of changes in recharge. Water levels in nearby wells seemingly screened at the same level may differ substantially. While the modelers did a good job based on existing information, they should have better included faults and springs. All predictions have huge uncertainties. The decision makers must consider the uncertainty in their decision making. This leads to needs for improved monitoring and mitigation plans.

The air quality analysis is incorrect and insufficient in that it ignores hazardous air pollutants

13-81 Does the potential emissions include emissions from the entire site including existing facilities and the proposed action? The annual PM10 emission rates are inconsistent in the DEIS. On page 3.9-1, the document states that 68.1 tons/year would be emitted while on page 3.9-11 it indicates the amount will be 84 tons/year.

13-82 The total design value PM10 concentration is calculated incorrectly. DEIS at 3.9-13. To be correct, the BLM must calculate the maximum 24-hour PM_{10} emissions by adding the maximum modeled 24-hour emissions from the Project with the maximum 24-hour baseline ambient concentrations. Table 3.9-8 implies that the maximum concentration caused by the project is 78.6 µg/m3 and that the total design value is 88.8 . This implies the background is 10.2 which is clearly not the maximum 24-hour baseline ambient concentration. The controlling EPA federal regulations concerning the PM_{10} standard also shows the error of the FEIS' calculations. The EPA regulations specifically differentiate between how the 24-hoour PM_{10} standard is determined compared to the annual PM_{10} standard:

> (a) The level of the national primary and secondary *24-hour* ambient air quality standards for particulate matter is 150 micrograms per cubic meter (ug/m³), **24-hour average concentration**. The standards are attained when the expected number of days per calendar year with a 24-hour concentration above 150 ug/m³, ... is equal to or less than one.[21]
>
> (b) The level of the national primary and secondary *annual* standards for particulate matter is 50 micrograms per cubic meter (ug/m³), **annual arithmetic mean**. The standards are attained when the expected annual arithmetic mean concentration, ... is less than or equal to 50 ug/m³.

40 CFR §50.6 (emphasis added). These regulations clearly show that the 24-hour standard is calculated using data representative of a 24-hour period, **not** over a period of a full year as the FEIS does.[22] Section (a) of the regulations, the 24-hour standard, specifically requires the use of the "24-hour average concentration." Section (b), the annual standard, utilizes the "annual arithmetic mean" -- the same calculation the FEIS incorrectly uses to determine the 24-hour emissions.

Based on the fourth highest over 3 year ambient value in Table 3.9-5, the maximum ambient should be

[21] According to the Air Quality Impact Assessment Report for the South Pipeline Project prepared by EMA, 1998, at p. 9, note. b: "A violation of the Federal [PM_{10}] standard occurs on the second exceedence during a calendar year; a violation of the State of Nevada [PM_{10}] standard occurs on the first exceedence during a calendar year."

[22] EPA guidance specifically requires that different averaging times need different background concentrations. The EPA's Guideline on Air Quality Models (GAQM), Section 9.2.1 on "Background Concentrations" states: "Background concentrations should be determined for each critical (concentration) averaging time." Section 9.2.2 states that: "Use air quality data collected in the vicinity of the source to determine the background concentration for the averaging times of concern."

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13-80 All modeled simulations would be verified by monitoring, and required mitigation measures would be implemented, if necessary. These measures would be specified in the approved Plan of Operations and the associated support documents (e.g., Waste Rock Management Plan, Water Resources Monitoring Plan, Contingent Long-term Groundwater Management Plan), and included as a condition of a BLM Record of Decision.

13-81 The air pollutant emission calculations included those portions of the existing Reona Project that would continue once the Phoenix Project commenced operation. The EIS (Section 3.9) states that potential PM_{10} emissions from the Phoenix Project are 68.1 tons per year (Environmental Management Associates 1999a). The EIS (Section 3.9.2.1) states that "Total PM_{10} emissions from the Phoenix Project permitted (process) equipment are approximately 84 tons per year." Both of these statements are correct. The 68.1-ton PM_{10} value reported on page 3.9-1 of the Draft EIS is the potential "permittable" PM_{10} that may be emitted during operational year 17 (which is the operational year with the greatest potential for PM_{10} emissions from the sum of permitted and fugitive dust sources). The 68.1 tons represent potential PM_{10} emissions for operational year 17 from those emission sources that are subject to NDEP permit regulations. Subsequently, the NDEP evaluated and authorized the operation of each of the project emission units subject to permit requirements at its maximum operating capacity (as may be limited by operational constraints or conditions). Because the permitting process evaluated each emission unit using the assumption that it would be operating at full capacity during the entire year, and the assumption that each emission unit would be operating each year, (along with a few changes in specific operating conditions) the result was an increase in potential PM_{10} emissions authorized in the air permit to 84 tons per year.

13-82 The comment suggests that the "total design value" PM_{10} concentration for the Phoenix Project used an inappropriately low background concentration (10.2 µg/m³) for the 24-hour value in Table 3.9-8, and suggests that the appropriate "maximum 24-hour baseline ambient concentration" is the 64 µg/m³ concentration provided in Table 3.9-5 as the 24-hour concentration for the Echo Bay McCoy/Cove Mine. The use of the 24-hour concentration from the Echo Bay McCoy/Cove Mine as the "maximum 24-hour baseline ambient concentration" is inappropriate because, as indicated in the Draft EIS (Section 3.9.1.3), the monitoring sites for this and other mines/industrial sites are operated to monitor local impacts of the particular source and reflect contributions from those source emissions. Thus, the monitored values are not representative of the PM_{10} background concentration, but instead represent the background concentration plus impacts of the facility being monitored.

Contrary to the comment's assertion that the Draft EIS incorrectly used an annual average background value to calculate 24-hour impacts, the Draft EIS (Section 3.9.2.1), recognized that the "background concentrations that were applied in the air modeling assessment are representative of clean conditions in remote areas (except for the town of Battle Mountain background concentrations)." To calculate a "conservative upper-limit 24-hour background concentration" for the Phoenix Project, the Draft EIS averaged the highest second-high 24-hour PM_{10} concentrations presented in the assessment of ambient PM_{10} monitoring data collected from many sites in northern Nevada (JBR 1999d) from 1995 (the year with the most complete data). The resulting value, 40 µg/m³, represented data from the range of ambient conditions relevant to the Phoenix Project, including areas impacted by mining, those unaffected by mining but instead impacted by other industry or population centers, and clean areas such as wilderness areas and national parks. Using this calculated conservative upper-limit 24-hour background concentration of 40 µg/m³, the "total design value" PM_{10} concentration for the Phoenix Project would be 118.6 µg/m³, as stated at the top of page 3.9-14 in the Draft EIS.

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13-82 somewhere around 64 (the value at Echo Bay which is located in similar topography). Adding 78.6 to this ambient suggests the maximum annual is very close to 150. The BLM must take a second look at this and include a detailed assessment of the ambient conditions at the site. Because of the extent of the existing disturbance, the onsite ambient is likely very high. Newmont/BMG may need to collect ambient PM10 data for a year to perform this analysis.

13-83 There is no discussion of hazardous air pollutants at all. It is common knowledge now that gold mines release mercury at significant rates to the air. In order for the BLM to claim that all environmental impacts have been considered, the BLM must assess mercury and arsenic emissions. This would include an assessment of the rate of atmospheric deposition downwind in the Humboldt River basin and Reese River.

Arsenic and mercury are among the most toxic substances released from mines. High levels of inorganic arsenic can be fatal. Arsenic damages many tissues including nerves, stomach and intestines, and skin. Breathing high levels causes sore throats and irritated lungs. Lower exposures may cause nausea, vomiting, and diarrhea, decreased production of red and white blood cells, abnormal heart rhythm, blood vessel damage, a "pins and needles" sensation in hands and feet, painful and profuse diarrhea, shock, coma, convulsions and death, irritation, inflammation, ulceration of mucous membranes and skin, and kidney damage. Mercury in all forms is deleterious to the nervous system. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems. Because the environmental fate of mercury cyanide is not well understood, it is possible that releases to leachfields will create very high local concentrations of mercury in the soils that may represent significant exposure pathways to wildlife. To not take all possible steps to avoid the release of these substances is irresponsible.

Soil Quality and Ecological Risk

13-84 Based on the contaminant levels in the rock proposed to be used for waste rock and tailings covers, it is unlikely that a healthy soil ecosystem will ever be established. We base that conclusion on the risk to soil invertebrates and plants. DEIS at 3.3-16-18. A healthy soil ecosystem depends on the linkage between soil activity and plants. The high levels of contaminants may also prevent essential soil microorganisms from becoming established. DEIS at 3.3-19.

The analysis of capping material properties on ecological risk factors relies on average capping material concentrations. Only net neutralizing material will be used for the caps. DEIS at 3.3-16. There will likely be little actual topsoil used in the caps because of the lack of acceptable material at the site. It will be necessary for the caps to "form" soil characteristics. Because of the high contaminant levels this may be difficult. Also, use of averages ignores the variability of contaminants around the site. It is likely that soil ecosystems will form variably across the site as a function of differing contaminant levels (along with differential moisture and nutrient levels and the interaction with the contaminants).

Vegetation Communities

13-85 There should be a map of the jurisdictional waters at the site. This would be easier to read and assess the extent of the area potentially affected than just using the descriptions in the text. DEIS at 3.4-6.

13-86 How sizable is the population of salt cedar on the tailings facility? DEiS at 3.4-7. Because salt cedar roots may "chase" water for 100 feet, once established, salt cedar may be difficult to remove from

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Regardless of whether the "total design value" (conservative modeled high plus background value) PM_{10} concentration for the Phoenix Project is the 88.8 µg/m^3 presented in Table 3.9-8; the 118.6 µg/m^3 presented in the Draft EIS on page 3.9-14; or 142.6 µg/m^3 calculated by the commenter, total ambient PM_{10} impacts are indicated to be in compliance with the applicable Ambient Air Quality Standards.

13-83 Please see the responses to comments 1-32 and 1-33.

13-84 The analysis of waste rock samples that represent potential cap material indicated that metals levels may be high enough to affect the growth of some plants. There are several unknown variables that could not be included in the screening-level risk assessment, including a more representative sample of cap material and an evaluation of the sensitivity of revegetation species. As discussed in the response to comment 1-35, these factors would be considered during the site-specific risk assessment(s).

13-85 Waters of the U.S. are indicated in Figure 3.4-1 (Vegetation Communities). As discussed on page 3.4-6 of the EIS, it is possible that, under current law, some of these areas are no longer jurisdictional. Therefore, Figure 3.4-1 represents the maximum extent of potential jurisdictional waters in the area of the project.

13-86 Salt cedar on the tailings facility currently exists as scattered individual plants. Upon reclamation, these plants would be destroyed through burial. If any plants survive or new individuals are discovered, BMG has a noxious weed control plan in place to address this issue. Please refer to the subsection entitled "Noxious Weeds and Invasive Species" in Section 3.4.2.1.

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13-86 tailings. Does BMG proposed to prevent the establishment and to eliminate existing populations of salt cedar from the tailings?

13-87 Loss of wetland vegetation in Willow Creek and other canyons would be a significant impact. DEIS at 3.4-11. BMG should mitigate this loss by preventing it in the first place. Dewatering water should be returned to the aquifer to limit the spread of the drawdown cone. See the discussion of this mitigation elsewhere. This is important because the permitting of a plan that would dry Willow Creek, a "water of the U.S." (DEIS, page 3.4-12) would be illegal. This is because it would fail to protect and maintain beneficial uses of the water.

13-88 In conclusion, we have argued that this project should not be built as proposed. We would like to work with the BLM and Newmont on a plan that will restore and protect the environment while still producing some revenue. But, ultimately, our bottom line is that this site must be cleaned up and it is not the BLM's responsibility to assure that Newmont makes a profit. BLM's responsibility is to prevent undue or unnecessary degradation: something the current proposed action, even with the mitigation and monitoring plan, does not do.

Thank you for considering our comments.

Sincerely,

Tom Myers

Tom Myers, Ph.D.
Director

cc: Western Mining Action Project
Nevada Division of Environmental Protection (without additional text)

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13-87 Please see the responses to comments 13-30 and 13-54.

13-88 Comment noted. As indicated in the responses to comments 13-3 and 14-3, the BLM has determined that the Proposed Action, as mitigated, would not cause unacceptable resource conflicts, or unnecessary or undue degradation. It is not the BLM's responsibility to assure that Newmont Mining Company is profitable in their endeavors; rather, it is the BLM's responsibility to manage the surface and subsurface resources under applicable rules and regulations. The prevention of undue or unnecessary degradation will be assured prior to approval of plans of operations.

December 20, 2000

Mr. Dave Gaskin
Division of Mining Regulation and Reclamation
333 W. Nye Lane
Carson City, NV 89706-0851

Re: Major Modification of Water Pollution Control Permit, Battle Mountain Complex, NEV87061

Dear Dave:

Enclosed please find our final comments on the subject water pollution control permit. As you stated in an email responding to a request for an additional week of review, you will consider these comments up to the point of issuing the permit. This comment letter focuses on the overall permit and the following documents: the Application for Major Modification of Water Pollution Control Permit NEV87061, Phoenix Project (Permit Application); Phoenix Project, Water Resources Monitoring Plan (Monitoring Plan); Phoenix Project, Waste Rock Management Plan (Waste Rock Plan). All documents were provided by NDEP personnel during a visit during late November.

From both from a surface reclamation and water quality point of view, this site currently is very degraded,. Both groundwater and surface water is currently degraded. Monitoring Plan at 14, 15. Groundwater pH varies from 5 to 10. TDS concentrations range up to almost 4000 mg/l. There are also high sulfate and metal concentrations. Monitoring Plan at 14. Additional data, including the wells assumed to represent background, should be provided. Mining has affected the surface water in Iron, Butte and Philadelphia Canyons. Monitoring Plan at 15. A good plan of operations at this site can actually make existing conditions better. Our comments on this permit and future comments on NEPA documents and the reclamation plan are and will be directed toward obtaining the best possible plan for leaving this mountain in better condition a hundred years from now than it is today.

Toward this goal, our first question is: how will NDEP determine whether existing mining is causing degradation? Asked differently, how will NDEP determine when degradation is getting worse when existing groundwater is already bad? It is not acceptable to write off the existing areas of low quality water. If BMG or their immediate predecessor is responsible for the current degradation, this plan should include remediation plans. Thus, our first comment is that the plan should be reworked to include plans for remediating existing degraded groundwater. The permit when issued should be very specific as to what a violation is when existing groundwater is already quite degraded. Mere reference to NAC regulations is not sufficient.

Even with some degraded surface water, most of the surface water in the region is high quality. Id. The plan for monitoring this surface water quality is good. However, there is another question regarding this. If the surface water becomes degraded, is there anyway that the applicant could claim that the degradation is due to past mining and how will NDEP distinguish between historic contamination just now reaching the stream and new contamination. This should be specifically addressed in the permit.

Application for Major Modification of Water Pollution Control Permit NEV87061, Phoenix Project

1. The description of the hydrogeology states that groundwater elevations change across faults by hundreds of feet. Permit Application at 19. This is not obvious on the map of potentiometric surfaces in

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the Monitoring Plan. NDEP should require the applicant to show where the faults that cause a significant head drop because such faults are frequently relied on as flow breaks. This reliance may be reflected in predictions of dewatering impacts or contaminant transport, therefore NDEP should be concerned about this statement.

2. We have similar concerns about the "[l]ocalized occurrences of vertical hydraulic gradients". Id. NDEP should require the applicant to provide a map showing the location of these vertical gradients and the source of recharge. If the artesian pressure occurs high in the mountain, it suggests either a highly pressurized regional aquifer or a local condition whereby pressure caused by recharge high in the surrounding mountains.

3. What is the spacing of the "4-inch perforated, corrugated, polyethylene pipe" that is designed to collect the leach solution? Permit Application at 24. Does NDEP have or request an analysis of the ability of the solution collection system to collect the leachate? Does NDEP accept the design the system, including the "lined storm overflow and solution collection channel", with respect to the potential for storm overflows? In other words, does NDEP independently peer review the design? Note that I did not find such an analysis in the files I reviewed at NDEP.

4. The combined volume of the event ponds is 27.34 million gallons. Permit Application at 25. This is 83.9 acre-feet. This will contain the design storm, complete draindown for 24-hours, draindown of the largest process solution tank, and freeboard. Permit Application at 25. The design storm is the 25-year, 24 hour event which is technically inadequate for a 28 year mine plan. Id. and Waste Rock Plan, Figure 11. There is a virtual certainty that the storm design will be exceeded during the plan life. NDEP should use its authority to require containment for a 100-year event[23]. There is also too little information provided to evaluate this capacity.

A. What is the drainage area that could provide water to the event ponds?

B. Does the analysis assume that the entire storm will infiltrate? What is the time period for the storm to pass through?

5. The biggest concern with the Phoenix Project is the potential for acid mine drainage, both during operations and after closure. Quotes such as "the majority of waste rock to be mined during the Phoenix Project will have the potential to generate acid and release constituent during oxidative weathering" indicate the scope of the potential problems. We offer the following comments on waste rock handling as discussed in the Permit Application.

A. How will the time for handling acid generating materials (AGMs) be minimized? Will it be placed in permanent dumps at the bottom of pits quickly? Will AGMs be covered or capped

[23]d) The primary fluid management system must be designed to be able to remain fully functional and fully contain all process fluids including all accumulations resulting from a 24-hour storm event with a 25-year recurrence interval. The department may require additional containment based on the following factors:

(1) Proximity to surface water bodies;

(2) Depth to ground water; and

(3) Proximity to population. Contingency plans for managing process contaminated flows in excess of the design quantity must be described in the appropriate operating plans. NAC 445A.433(1), emphasis added. In this case, it is likely that groundwater would provide the justification. Also, the length of operating plan being discussed for this site suggests that NDEP should consider a rulemaking to give themselves the authority based on the length of the plan.

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while stored prior to permanent placement?

B. What is "in situ neutralization"? Permit Application at 33. Does this include the addition of lime?

C. Submerging AGMs in saturated backfill will eventually eliminate oxygen. However, during the saturation process, which may require **many years of recovery**, oxidation will occur. **Saturation does not occur as a wetting front**. As groundwater levels rise, capillary action will wet the soil above the line of saturation. There will also be heterogeneities that will cause uneven wetting front and fingers of groundwater to extend into the backfill. It is here that water meets air and oxidation will occur. As the groundwater flows through the backfilled pits, it will pick up products of this oxidation and contaminate downgradient groundwater. **This will constitute a degradation of groundwater and violation of the Nevada Water Pollution Control Act**. A better plan than allowing gradual saturation of the backfill is needed.

Surface drainage and rainfall seeping through the surface is also a problem. Unless the backfill is compacted in thin layers (as it should be), the infiltration rate will be very high. Pits not completely backfilled provide sumps for rainwater to collect. Upon infiltration, this water will mix with air in the unsaturated backfill above the groundwater level. NDEP must require that pits be completely backfilled and compacted to minimize infiltration. Also, the most reactive rock should be buried at the bottom of the pits where it will be rapidly submerged. NDEP should consider whether this is feasible (ie., will sequential backfilling provide the opportunity to bury this material? Can the Phoenix pit, which will be backfilled after all mining ceases, be backfilled quickly enough?)

D. The applicant will use "re-vegetated caps" "that will maximize the moisture storage capacity and evapotranspiration components of the cap water balance" to minimize infiltration reaching the AGMs in the waste rock dumps. Permit Application at 34, 35. By using a "five-foot cap", the applicants will not actually "maximize the storage capacity" which implies no upper limit to the thickness. Rather, the hydraulic design by Exponent referred to on page 35 is a balance of costs and hydraulic properties. (Unfortunately, this study was not available for us to review. We have are skeptical about its completeness because most similar studies we have seen assume such homogeneous conditions as to be useless. In other words, if the cap is modeled as homogeneous, the realities of construction render the design assumptions incorrect.) There is no discussion of whether there is sufficient net-neutralizing material onsite to cover the waste rock (in both the dumps and the pits). NDEP should be certain that the applicant can actually do what it proposes by requiring an analysis of the available cover material.

E. We **strongly support** the intent of the Water Balance and Vadose Zone Monitoring section. Permit Application at 39,40. But there are a few points that need elucidation as suggested by the following questions.

I. What will be the density of the boreholes or how will their location be determined? We recommend that aspect, soil gradation and vegetation be considered in siting the wells.

II. How long will these monitoring wells be monitored after mine closure? This concerns us because the wetting front could break into the waste rock during a 100-year snowmelt which may not occur during the monitored period. In fact, this is a major

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concern in all semiarid region monitoring. If runoff or seepage is event driven, the event that causes serious degradation may occur only a few times per century. But, this is still degradation of groundwater.

III. We suggest that in addition to determining saturated hydraulic conductivity on undisturbed samples, the applicant should also determine conductivity as a function of saturation. This would allow the applicant, at closure, to provide a detailed, well calibrated, unsaturated flow model of infiltration into the waste rock. With this, the applicant would be able to demonstrate to NDEP whether long-term infiltration will be a potential problem and to help determine how long these monitoring wells will be maintained.

IV. We also support the inclusion of the micro-climate monitoring stations. Permit Application at 38,39. The permit should include a description of how many stations will be required and the frequency of monitoring. The areal distribution should be adequate to sample the differing elevations and aspects at the site. Continuous wind speed and direction, solar radiation[24], and temperature and daily precipitation monitoring is also necessary. In addition, a lysimeter to measure evapotranspiration at one of the sites would also be useful.

6. With three pits requiring dewatering, the applicant proposes to use all of the dewatering water in the proposed milling and heap leach operations. Permit Application at 42. The original plan was to construct a drain beneath the pits and discharge the dewatering water to the valley floor[25]. This suggests that more water was expected at one time. NDEP should be certain that this facility has not underestimated the dewatering requirements because there could be a need for an emergency modification to this permit to allow a discharge.

The most substantial discussion of dewatering is in the Waste Rock Plan. Dewatering predictions are quite low when compared to other mines in the region. The highest is 1500 gpm during year 21 at the Phoenix Pit. If the numbers in Table 7 are correct, the Phoenix Pit will be at elevation 5540 during this year which is about a 1250 foot drawdown. There will likely be a substantial gradient toward the pit developed at this point. It seems very unlikely that the values are actually this low. (Note: at this point we have not been provided a copy of the groundwater model. We will be reviewing this at a future time and will provide detailed comments to the relevant agencies at that time.)

The assumption that "[b]ackfilling of the pits is assumed to occur rapidly ahead of ground water recovery in the backfilled pits, and it is assumed to start at the beginning of the year immediately following the end of mining in a given pit" requires a belief that rapid waste rock handling will occur. The lower several hundred feet of a pit will usually fill in a year or two. NDEP should verify that the applicant will actually be able to handle that much rock. This pit will not be backfilled sequentially, therefore it will require a costly second handling of waste rock. If the assumption does not actually occur, how will this affect the modeling. More importantly, it will lead to the formation of a pit lake in an area of extremely acidic rock. (Note: When calculating a reclamation bond, the cost of backfilling this, and the other pits, must be included.)

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[24] Solar radiation monitoring is expensive. It would be acceptable to have one well placed station for the entire site.

[25] "To prevent anticipated pit lake water quality problems due to the composition of the host rock in one of the pits, Battle Mountain Gold is proposing a permanent groundwater water conveyance system from the pit to a location that will serve as an infiltration basin and/or wetland." Letter from Michael C. Mitchel, Acting District Manager, Battle Mountain BLM to L.H. Dodgion, NV Division of Environmental Protection, dated January 9, 1995.

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7. The document states the tailings disposal area will be a zero discharge facility. Permit Application at 46. If a discharge occurs, either as an overflow due to storm runoff, seepage through the dam, or seepage into the ground beneath the facility, has a permit violation occurred?

8. The tailings in the Copper Canyon drainage, and any other drainage, are illegal. Construction of the tailings facility in Copper Canyon must be regulated as a discharge under Section 402 of the Clean Water Act. The plan fails to properly regulate the discharge of pollutants into Copper Canyon and other drainages resulting from the construction of a tailings impoundment.

Such construction will discharge rock, dirt, synthetic materials, and other pollutants into Copper Canyon. These materials are clearly "pollutants" for the purposes of coverage under Section 402.[26] The disposal of these pollutants into Copper Canyon via, among other sources, dump trucks, loaders, backhoes, and other equipment constitutes a "point source" under Section 402 as well. Concerned Area Residents for the Environment v. Southview Farm, 34 F.3d 114, 119 (2nd Cir. 1994). Copper Canyon is an intermittent stream and is considered a "water of the U.S." for purposes of the CWA. U.S. v. Earth Sciences, 599 F.2d 368, 373 (10th Cir. 1979); Quivira Mining Co. v. United States EPA, 765 F.2d 126, 129 (10th Cir. 1985). The construction of the facility will a substantial length of Copper Canyon. In this case, it is clear that the discharge of rock, dirt, liner material, and other pollutants into Copper Canyon must be covered under a NPDES permit. However, based on the proposed complete obliteration of a large segment of the stream bed, the full range of standards cannot be met and the tailings facility will have to be substantially redesigned in order to comply with the CWA.

In this case, the applicant does not even propose to divert the stream around the impoundment. Even if they did proposed a diversion, it would be illegal. Such a diversion does not "maintain the natural structure and function of the ecosystem" in that watershed.

> The Clean Water Act (CWA) was "a bold and sweeping legislative initiative," United States v. Commonwealth of P.R., 721 F.2d 832, 834 (1st Cir. 1983), enacted to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. §1251(a)(1994). "This objective incorporated a broad, systematic view of the goal of maintaining and improving water quality: as the House report on the legislation put it, 'the word "integrity" ... refers to a condition in which the natural structure and function of ecosystems [are] maintained.'" United States v. Riverside Bayview Homes, Inc., 474 U.S. 121, 132, 106 S.Ct. 455, 462 (1985) (quoting H.R.Rep. No. 92-911, at 76 (1972) U.S. Code Cong. & Admin.News 1972, at 3744).

Dubois v. U.S. Department of Agriculture, 102 F.3d 1273, 1294 (1st Cir. 1996).

The applicant also relies on this tailings impoundment to claim that "no discharges of stormwater to waters of the U.S. are anticipated from any Phoenix Project facilities in Copper Canyon". How will the applicant monitor compliance with this? It should be a part of the permit. But, as just discussed, preventing this flow may be illegal because it destroys the natural structure and function of the ecosystem.

A similar concern results from the inactive waste rock and leach facilities in Philadelphia Canyon. Currently, stormwater is retained to "prevent any run-off from contacting waters of the U.S." How is this

[26] "Pollutant" is defined in the CWA to include, among other materials: rock, sand, solid waste, and industrial waste. 33 U.S.C. § 1362(6).

and will this continue to be monitored[27]?

Water Resources Monitoring Plan

The plan calls for sampling groundwater quarterly, with no justification. Monitoring Plan at 16. NDEP should evaluate the sampling frequency based on the source of the flow to the well. Does the groundwater level rise and fall frequently due to natural recharge events? If so, the aquifer chemistry is highly affected by ephemeral events. Quarterly sampling in this case will be insufficient; we recommend monthly to adequately assess the groundwater quality. Samples during rising and falling levels may differ, especially in areas with sulfidic rock, as oxidation and reduction occurs. Quarterly sampling may completely miss important changes. However, if the sampling is of large regional aquifers, then quarterly sampling is sufficient. The analysis provided in the report provides no justification.

We note that the NAC does not specify sampling frequency. The best guidance is a requirement "[t]hat the monitoring system is adequate to determine if the process components are operating so as to protect the waters of the state from degradation." NAC 445A.397(3)(c). If the monitoring system is sampled so infrequently that significant degradation goes undetected, this regulation is being violated.

The applicant proposes that surface water samples only include "measurement of field parameters". Id. This includes only pH, temperature and conductivity. Monitoring Plan at 25. Recognizing that historic mining has caused surface waters "typified by low pH, high acidity, and elevated TDS, sulfate and metal concentrations", how can NDEP accept such a paltry monitoring plan? Monitoring Plan at 15. The watersheds on Battle Mountain are subject to rapid and extreme changes in conditions. For example, months of drought may be followed by two weeks of flood. This flooding causes runoff from mine facilities in semiarid environments and the monitoring plan should be fashioned for this reality. As statisticians realize, a sample is only a representation of the population of potential observations. In this case, the population of data is a continuously monitored observation of water quality data. This may not be feasible at all locations (see next paragraph), but the sample design must at least provide a decent representation of the actual situation. As observed by Hirsch, et al[28], "water quality samples from a river are collected only infrequently, although the water quality is changing constantly". The remainder of their chapter discusses adequate sampling frequencies.

There is inexpensive technology that would allow frequent observation of various field parameters. As a university hydrologist, I established field sites in stream where the temperature was recorded automatically every half hour. Similar meters are available for pH, conductivity, and dissolved oxygen. All meters cost less than 200 dollars. NDEP should begin requiring this type of sampling for surface water sites. At this site, because of the flashy nature of the streams, in addition to the half hour sampling, monthly sampling with a full profile 1 analysis[29] of surface water during spring snowmelt is required. During the remainder of the year, quarterly analysis is sufficient. NDEP should at least require the applicant to provide a detailed analysis of any different sampling frequency.

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[27]These two comments raise a general question regarding the monitoring of stormwater discharge. As noted, stormwater runoff from the waste rock reaching waters of the U.S. would not be permitted. In other words, it would be a violation. NDEP should require monitoring of this runoff. However, we recognize the difficulties inherent with this recommendation. Sampling ephemeral flow requires someone to be onsite and observant at odd times coincident with a storm.

[28]Hirsch, R.M., D.R. Helsel, T.A. Cohn, and E.J. Gilroy, 1992. Statistical Analysis of Hydrologic Data. Chapter 17 in Maidment, D.R. (Ed. in chief), Handbook of Hydrology. McGraw Hill, New York.

[29]The full analysis is needed because of the observed degradation of surface water in the area.

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The monitoring plan is **deficient** in that it provides **no information on screening levels**. Without knowing where the samples are taken in the vertical profile, it is impossible to adequately assess any contamination. As noted in the hydrogeology section of the monitoring plan, the geology and flow conditions at this project are very complicated. It is likely that the source of water differs with depth. In other words, it is likely that contamination at level x may result from different sources than contamination at level y. Monitoring wells should be screened appropriately. The monitoring plan should contain analysis of the choice of screening levels.

Because the discussion of the preceding paragraph is not provided in the plan, we assume that monitoring wells are screened over a thick section of the aquifer. This may bias the results. For example, contamination in the top half of the screening will be diluted by mixing with groundwater from different levels. Degradation could clearly occur in part of an aquifer but not in other parts. Screening thick portions of the aquifer may prevent degradation from ever being detected. For this reason, **the monitoring plan should include wells with multiple completions** so that samples could be taken from different aquifer levels.

The issue just discussed raises significant questions about the interpretation of Nevada's water pollution protection activities. For reference, the complete citation follows:

> **445A.424 Limitations on degradation of water; exemptions.**
> 1. A facility, regardless of size or type, may not degrade the waters of the state to the extent that:
> (a) The quality of surface water is lowered below that allowed by NRS 445.253.
> (b) For ground water:
> (1) The quality is lowered below a state or federal regulation prescribing standards for drinking water; or
> (2) The concentration of WAD cyanide exceeds 0.2 mg/l. The department may establish a numerical limit for any constituent not regulated by subparagraphs (1) and (2) which may reasonably be expected to be discharged by the facility in sufficient volume and concentration to cause an adverse impact on human health.
> © The quality of those waters of the state which already exceed the criteria established by subsection 2 is lowered to a level that the department finds would render those waters unsuitable for the existing or potential municipal, industrial, domestic or agricultural use.
> 2. The department may exempt a body of ground water or portion thereof from the standards established in subsection 1 if the request for an exemption to the ground water standards and the supporting information is submitted as part of the application for the permit. The following criteria will be considered by the department in determining whether to exempt a potentially impacted body of ground water from the standards in subsection 1:
> (a) The impacted ground water does not currently serve as a source of drinking water and because of the following reasons the ground water will not serve as a source of drinking water:
> (1) The ground water produces a mineral, hydrocarbon or geothermal fluid which the applicant can demonstrate to the satisfaction of the department exists at a concentration that is expected to be capable of commercial production and that releases by the facility will not affect this production;
> (2) The ground water is situated at a depth or location which makes recovery of water for drinking economically or technologically impractical; or
> (3) It would be economically or technologically impractical to render the water fit for human consumption; or
> (b) The total dissolved solids in the ground water is more than 10,000 milligrams per liter and

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the ground water is not reasonably expected to become a supply of drinking water.

What does degradation mean? The legal definition of degrade is "to alter the physical or chemical properties of or to cause a change in the concentration of any substance in the waters of the state in violation of the standards established pursuant to NAC 445A.424." NAC 445A.357. There is no discussion or even mention of the level at which the groundwater is degraded. Is it acceptable to mix water over thousands of feet of aquifer which would dilute degradation of the top 50 feet? Or, is there some implied standard based on the normal screen length on a pumping well? The issue raised here goes way beyond this project; it raises questions that **may require a rulemaking** to improve the definition.

There is an assumption in the Waste Rock Plan that backfilling will occur, therefore pit lakes will not have the opportunity to form.. There is little monitoring of wells downgradient from the pits, presumably because of the backfill requirement. For reasons discussed above regarding the placement of acid generating materials, there is a substantial possibility of groundwater contamination occurring due to infiltration into and seepage through a backfilled pit. For example, well Phx-K downgradient of the Phoenix pit is the only well to potentially monitor contamination resulting from 1200 feet of backfill. This well should have multiple completions so that samples can be drawn from different levels. (See our discussion above regarding sampling different layers.)

Also, there needs to be a commitment to continue monitoring long after the pits are backfilled. It is not until the groundwater has essentially fully recovered that NDEP can have any confidence in whether the backfill is degrading the groundwater.

There are also concerns about the proposed placement of monitoring wells in this region. Most wells will be on the boundary of the site with approximately 1/3 to ½ mile spacings. There are only about 3 new wells proposed on the interior of the site. This spacing is insufficient to detect the source of groundwater degradation or even if it is occurring in the vast space between the observation wells. The geology map in the Water Resource Monitoring Plan shows a complex, faulted situation. It is likely that flow occurs in directions not predicted by the contours on the groundwater map because this map only includes the unconfined surface. This ignores localized confined aquifers and faults. It is likely that vertical gradients exist which would cause vertical flow between aquifers. It may be years before degradation is actually detected by the proposed monitoring wells at this facility.

Monitoring wells in the southern half of the site show groundwater degradation without a plan for remediation. For example, CM01, CM08, CM22, CM23, and CM24 show current degradation. Constituents exceeding standards include TDS, SO_4, Mg, and Cl. While the levels on some are very high, concentrations at CM08 are less than the others, primarily because it is downgradient of tailings area number 3 by almost ½ mile. This raises several concerns about the hydrology of this region.

First, it is essential to consider the thickness of the alluvium in the region. The wells presumably are completed only in the alluvium. Note the need for discussion of this in the monitoring plan above. There may be significant vertical movement of contaminants which, with a substantial hydraulic connection between alluvium and bedrock, could degrade deeper groundwater as well. In fact, leaks that occur in the center of the tailings may totally miss the monitoring wells, depending on their screening, if there is significant vertical groundwater movement.

The hydraulic conductivity in this region must be very high. The monitoring well map in the Monitoring Plan shows a five foot drop in about 1.5 miles. This is a gradient of 0.00063. For water to travel ½ mile in 10 years, the Darcy velocity would be 0.72 ft/d. This corresponds with a conductivity of 1150 ft/d, a

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very high value. The vertical conductivity would likely be high as well because vertical anisotropy is usually low in alluvium. If there is any vertical gradient, there could be substantial flow deep into the groundwater. A substantial leak under the tailings could create a mound on top of the water table which would cause a very high gradient. Current monitoring would not detect this.

Wells CM26 and CM27 are at the southwest corner of the heap leach pad. They are about the only wells on the site that have exceedences of arsenic. How can this be explained? Does the groundwater have naturally high arsenic levels in this region.. If there was a leak in the heap liner, we would expect more constituents to exceed standards.

If you have any questions, please contact me. Thank you for considering our comments.

Sincerely,

Tom Myers, Ph.D.
Director

cc:
Battle Mountain BLM
John Mudge, Newmont Mining Co

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